ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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What in the World!

A wave of confidence has swept the country. We believe business will improve if this is maintained. People will spend money and stop hoarding and the banks will again extend credit to business. Psychology is a good half of business and we hope the stock market indicator will be supported by business realities very soon.

●

St. Lawrence power keeps a front page position. Many cost accountants may find it interesting to check the data in the latest report as they appear in this issue.

●

Following his discussion of manufacturing, Mr. Morrow deals with trade associations and collective selling in this issue. His arguments appear logical and his reasoning sound, but —

●

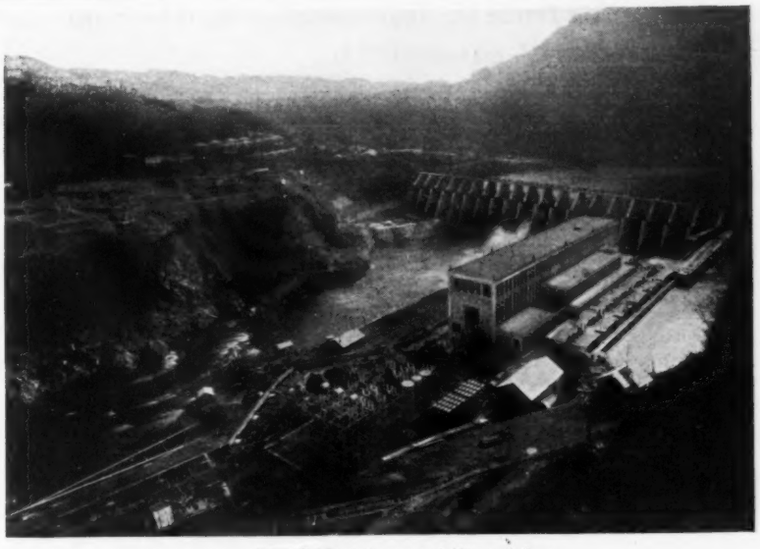
We appreciate letters from readers and welcome frank discussions of our editorials and articles. They help us keep on the right track. In addition, when letters are published they interest readers and create comment that may aid the industry to keep on the right track.

●

Have you read the article "From Insull to Injury," by N. R. Danielian, in the current "Atlantic Monthly"? The author is not kindly but his article stimulates thought. Another stimulating book is "The Modern Corporation and Private Property," by Berle and Means.

●

We have sound banks, we have beer, we have farm and unemployment relief — now we need nerve to go to work.



Toyomi (Japan) power station and dam

MARCH 25, 1933

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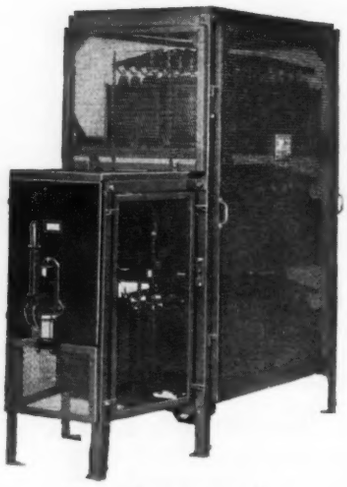

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GENERAL ELECTRIC

ELECTRICAL WORLD

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for the Week Ending

March 25, 1933

Stricter Regulation of Utilities Urged by Governor Lehman of New York

URGING the enactment, in a special message to the state Legislature, of bills to provide stricter regulation of public utilities, Governor Lehman of New York has undertaken to follow in the steps of his predecessors by fostering new restrictions in the regulatory field. In recognition of apparent abuses Governor Lehman offered a program to carry out recommendations of the state Public Service Commission.

The Governor's message read in part:

The impact of recent events has compelled new interest in the regulation of our public utilities. I have never doubted that many of the officials of our utilities are fully aware of the social responsibilities of their companies and have conducted their businesses in that spirit. But others have not been and are not so scrupulous.

Serious abuses have been forcefully brought to our knowledge. In certain cases rates have been retained at levels distinctly too high for these days.

For vigorous regulation

I believe it essential that the consideration of any phase of this public matter be aimed, not in molding the Public Service Commission into a mere quasi-judicial body, but in maintaining and strengthening it as an administrative agency for the direct and vigorous regulation of the public service. I recommend:

A bill to eliminate certain well-known holding company abuses by decreasing the percentage of stock which may be held by a holding company without public approval; by limiting the charges made, and, furthermore, by authorizing the commission to strike out of operating expenses of a company all unjustifiable charges imposed by a holding company.

A prohibition against operating companies loaning their funds to holding companies for holding company purposes unless approval of the commission be first obtained.

A bill which makes impossible without the prior approval of the commission: First, the diversion of funds by means of loans or advances from operating utilities to other companies; second, the payment of moneys by the operating utilities to various corporations in the holding company chain for the latter's securities and services, and, third other practices, such as charging to operating expenses the cost of marketing securities of holding companies.

Provision whereby any municipality or group of consumers may become a party to any suit or proceeding before the commission or any court when the municipality's interests and those of its citizens are considered at stake.

Expand municipal service

There are now in operation within the state more than fifty municipal plants. Provision should be made to authorize the commission to permit villages operating electric plants to supply their services to territory immediately adjacent when such services can be offered at rates lower than those which could otherwise be obtained.

Following Governor Lehman's suggestions bills have been introduced before the New York State Legislature embodying the principles for which he pleaded. Prospects of early and favorable action upon these measures were increased by a telegram sent to the Governor by Floyd Carlisle, chairman of the boards of Niagara Hudson Power Corporation and Consolidated Gas Company.

Mr. Carlisle said in part:

"I believe these proposals are in the interest of both the consumers and the companies and I hope that appropriate legislation carrying out your recommendations may be passed."

▼

Virginia and Muscle Shoals

Amendment of the Muscle Shoals resolution now pending in Congress (ELECTRICAL WORLD, March 18, page 342) will be asked by the Commonwealth of Virginia to provide that she share with Alabama and Tennessee the proceeds from the federal water-power plant at the falls of the Tennessee River. George C. Peery of the State Corporation Commission maintains that if Alabama and Tennessee, through which the river runs and on whose territory dams are situated or contemplated, are to get 5 per cent each of the gross proceeds from the sale of power as proposed in the Norris resolution, Virginia should get a percentage of the proceeds because most of the water in the Tennessee River originates in Virginia territory.

▼

Insull Extradition Refused; Toronto Case Delayed

Defeat of a recent renewal of the federal effort to extradite Samuel Insull to answer Cook County, Illinois, charges connected with his utility interests was revealed this week when the United States Legation in Athens stated that the Chargé d'Affaires had made an informal plea to the Foreign Minister several weeks ago. Taking up the question as to whether the decision of the Court of Appeal was appealable and whether renewal of the case was possible on production of fresh evidence, the government prosecutor described the verdict as juridicially inviolable.

The scheduled extradition proceedings in Toronto against Martin J. Insull have also been postponed until March 25.

Reorganization planned

Plans involving the reorganization of the United Public Service System are nearing completion, according to reports in Chicago. Federal Judge Walter C. Lindley has authorized the United Public Utilities Company and its receiver to enter into a contract with the Middle West Utilities Company and its receivers for an exchange of interest in the United Public Service Com-

pany. It is proposed to exchange all interest in United Public Service and subsidiary for a block of United Public Utilities 5 per cent income bonds, which will be issued, and the controlling stock of the Kentucky properties of United Public Service. The proposed contract will be submitted to security holders by the reorganization committee which is working out a solution to the many difficulties encountered.

Several dividends restored

Several dividend announcements by companies in the Middle West Utilities system were made during the past week. Directors of the Wisconsin Power & Light Company authorized again the immediate payment of dividends of $1 a share on the 6 per cent preferred stock and $1.16⅔ on the 7 per cent preferred, to stockholders of record of February 28. The dividends were previously declared payable March 15, but rescinded because of the bank holiday. The Lexington Utilities Company has again declared a dividend on its 6½ per cent cumulative preferred stock, payable as of March 15, the dividend having been previously rescinded because of the bank holiday. The regular quarterly dividend of $1.50 on the $6 cumulative preferred stock of the West Texas Utilities Company will be paid on April 1. Edward N. Hurley and Charles A. McCulloch, receivers for the Middle West Utilities Company, have announced that the Missouri Public Service Company and the Arkansas-Missouri Power Company, subsidiaries, would pass their preferred dividends, due April 1 and May 1, respectively, because of unfavorable financial conditions.

In a letter sent to the stockholders, which accompanied the 26th consecutive preferred stock dividend payment made last week, announcement was made that the last trace of the Insull interests in Public Service Company of New Hampshire has been definitely erased. J. Brodie Smith, vice-president, stated that the Insull interest was definitely ended and the entire present board of directors are residents of northern New England.

▼

Trade Commission Hears of "Avoided" Income Taxes

After the Federal Trade Commission completed its hearings of the United Gas Improvement Company last week and mutual expressions of good will and appreciation had been made (page 373), Judge Robert E. Healy, commission counsel, offered a surprise by telling the commission of several stock-trading deals by which the U.G.I. realized a profit of $9,300,000 and upon which income tax was "avoided." He explained that the trade was between the United Gas Improvement Company and the Associated Gas & Electric Company.

An unidentified official of U.G.I. when informed of Judge Healy's statements, according to press reports, said:

"It is true that the U.G.I. made about $9,000,000 on the General Gas & Electric Company transaction and that no income tax was paid on this sum. It was all perfectly legal. The tax laws do not require the payment of tax on profits made from the trade of securities. The company was very particular to comply in every way with the provisions of the tax laws."

▼

Kansas Commission Law Passed; Personnel Named

Reformation of regulation in Kansas became effective last week when the bill creating the new Kansas corporation commission was made a law. The Senate accepted the House amendments to the measure providing for a bipartisan body and reducing the salaries of the commissioners to $3,000 a year. The new commission is a combination of the public service commission, the charter board and the blue sky department.

Formerly the commission was in charge of all utilities work in the state, rate, regulation, services and also had supervision over all securities issues of the utilities. It now takes over the supervision of all securities sold in the state, has charge of all stock and bond issues of a speculative nature and must grant all permits and make such restrictions relative to the sale of stocks and bonds as may seem proper. It is believed a large sum of money will be saved the taxpayers and more efficient service will be given by the consolidated departments.

Commissioners appointed

Immediately after the law went into effect Governor Landon appointed Jesse W. Greenleaf and Homer Hoch, two Republican members, and announced that a Democratic member would be named in the near future. Thus Thurman Hill, member of the old commission, who is under investigation by the Legislature at the present time, was legislated out of office.

In commenting on the appointees Governor Landon said in part: "Greenleaf has served with distinction for many years on this commission and has had a fine part in some of the most important rate regulation questions this state has ever undertaken. . . . Homer Hoch is a nationally recognized figure in rate legislation. He served fourteen years on the interstate commerce committee of the House of Representatives and was the ranking Republican member of that committee. His name is connected with much of the important rate legislation of that period. I consider that Kansas is extremely fortunate in being able to obtain the services of such outstanding men."

▼

Washington, D. C., Plant Progresses

Completion of the new power plant of the Potomac Electric Power Company at Washington, D. C., is now expected by October, it is announced. The project, begun some time ago (ELECTRICAL WORLD, July 30, page 136), will cost about $731,000 for the building and approximately $5,000,000 for equipment.

There Is No Stopping with One Mountain

To earnest and cold-blooded observers of indexes and business reports there is little aid and comfort in the present situation. They point to February, on the whole a discouraging month from the production viewpoint. They extend their didacticisms to the most recent and poor records of energy production, carloadings, bituminous coal output, security and commodity market prices and say — "See there."

Facts or no facts, the truth is that America has embarked upon a voyage with the setting of the course and the probable outcome dependent almost wholly upon that old-fashioned matter of faith. Faith in the rightness of certain principles, faith in the ability of high administrative office to enable their application, and faith in the determination of us all to see the thing through to a finish.

Today the outlook for business and the American people, in economic turmoil, is no less a matter of encouragement for the things that have not happened than for the things that have actually been accomplished. Of 4,000 banks still closed after the holiday many will not be permitted to open again, but acting on the basis that the banking crisis must not arise once more we have proceeded a long, long way from the uncertainties of a few weeks past. There are, of course, other problems to be solved. Matters of stupendous difficulties.

Pertinent: Only $3,000,000 of the new currency was required, hoarders returned the old; war debt conferences scheduled for April may alter the status of exports (lower in February than any time since 1904) and imports (slightly above the July low); dollar rise in foreign exchanges, with reversal of gold flow likely when international exchange resumes; retail sales show strength; firm executive stand for economy reduces likelihood of large appropriations for unsound relief; indexes stand at new lows; Congress growls, but will go through its paces as long as the ringmaster thinks before it does — not a difficult task.

Pinchot Bids Investigators Continue Pennsylvania Quiz

After a discussion with Governor Pinchot on the various matters at issue the Pennsylvania Senate committee on utilities decided this week to make a complete and impartial investigation of the public service companies and their relation with the Public Service Commission. The Senate passed finally the McClure bill to continue the investigation and appropriate $100,000 for the inquiry after the committee had met Governor Pinchot at the Executive Mansion. At the conclusion of the conference Mr. McClure issued this statement: "Senator McClure told the Governor that the committee had unanimously decided to proceed with a vigorous, impartial and complete inquiry under the terms of the Senate resolution, and that the committee had called to invite the active co-operation of the Governor and to ask him to suggest lines of inquiry for the good of the people of the Commonwealth. The Governor stated that he welcomed the opportunity to co-operate on the basis of Senator McClure's statement . . ."

The fate of Dr. Clyde L. King, chairman of the commission, remains somewhat uncertain. In a communication to the Senate last week Governor Pinchot asked permission to withdraw his nomination of Dr. King, submitted January 3, 1933, but friends of the Governor in the Senate apparently were not prepared for a test vote, as the communication was sent to the committee on executive nominations without objection on a motion of Senator George Woodward. The consensus is that the Senate will adjourn *sine die* next month or some subsequent month without action having been taken on Dr. King's status.

Eaton assails King

In addition to the charges made by Governor Pinchot, Dr. King was bitterly assailed by Oliver K. Eaton, who recently resigned as chief counsel of the committee (ELECTRICAL WORLD, March 11, page 305). "His professed ignorance of what had been accomplished by the commission since he became head of the commission," Mr. Eaton said, "proved conclusively his utter incompetence. Dr. King fails to appreciate the true function of a public service commission, which is fundamentally created to represent the people and the public generally . . . Dr. King is and was in a position to render a great public service. His whole attitude indicated, however, that he is a defender of public utilities rather than engaged in an effort to safeguard the interests of the public. When called to the witness stand he found himself in the unenviable position of being on trial. His records were subpœnaed. Instead of co-operating, he proceeded with brazenness to tell the committee that there was no need for further investigation. In our opinion Dr. King is absolutely unfit to remain as chairman of this commission; as long as he remains at the head of this body proper utility regulation is hopeless . . ."

▼

More Utility Bills Placed Before State Legislators

DELAWARE—Would create public utilities commission.

ILLINOIS—Would require public utility company to bear cost of commission appraisal of property. Would impose a tax of 1 per cent of gross receipts on public utility companies. Would authorize appointment of five senators to investigate rates. Would require commission to assess property of all public utilities, the assessment to be based upon the value placed upon property for rate-making purposes. Would decrease membership of Illinois Commerce Commission. Would prohibit city, village or incorporated town with population of 3,000 or more from granting franchise, license or permit to a public utility to furnish electricity, gas, telephone or other service unless ordinance or by-law making such grant is published in the newspaper and inhabitants are given opportunity to be heard with respect to rates and other essential facts concerning operation of such utility.

KANSAS—Would replace public service commission with corporation commission.

MARYLAND—Would authorize incorporated cities and towns to finance acquisition of electric, gas or water plants by pledging revenue derived from operation of plants without levying an ad valorem tax.

References to previously reported impending bills will be found on page 308 of our March 11 issue.

▼

Hoover Dam Gates Offer 4,000,000 Lb. Assembly

Supposedly one of the largest electric arc-welding projects to have been undertaken, Westinghouse Electric & Manufacturing Company has started work at East Pittsburgh on the construction of the cylindrical gates for the Hoover Dam development. Each of eight massive cylinders will be 32 ft. in diameter and 8 ft. high and will weigh 240 tons. It is estimated that 96 freight cars will be required to transport the partially fabricated units to the dam site.

Six months will be needed to complete the assembly and it is announced that about 250,000 man-hours will be involved.

Supervisory-Controlled Station Pumps Under 3,000 Ft. Head

Collecting water at a point 3,000 ft. below the community which is to use it and yet but half way to the bottom of the canyon, where vast quantities have for years flowed inaccessibly by, Westinghouse engineers have completed an installation at Indian Garden Springs, Arizona, which is unusual among water supply systems. For years the community served received all its water by railroad tank car, 70,000 gal. a day. Now modern pumping equipment has solved the problem in a more satisfactory and less costly fashion.

The main pump house, a short distance below the reservoir, provides a positive suction head. Four 17-stage vertical, centrifugal, turbine-type pumps, each driven by a 60-hp., 2,300-volt, squirrel-cage induction motor, are used. Each pump is good for a vertical lift of 1,700 ft., two pumps in series. Pumps are located 3,153 ft. in vertical distance below the top of the tanks on the canyon rim with a total pipe length of 12,000 ft. Each unit can handle 85 gal. per minute against a head of 3,400 ft.

Supervisory control used

The site of the pumping station is difficult to reach and is accessible only by a narrow trail down the cliffs. The isolated location, combined with the nature of the station, made it undesirable to keep an operator on duty for starting and stopping the pumps and operating the valves. By means of visicode supervisory control, the station is normally unattended, being completely operated by a man in the power house, on the rim.

The supervisory control is arranged so that the operator at the power house can perform the operations and receive supervision indications as follows: (1) Start, stop and receive an indication of status of each pumping unit; (2) open, close and receive an indication of position of the drain valve; (3) control and receive an indication of position of the check valve jackscrew adjustment; (4) receive an indication of low water in the reservoir; (5) receive low-temperature indication; (6) ring and connect telephones at each station to line wires for communication.

▼

Floods Halt Louisville Plant

Yielding to floodwaters brought about by heavy rains in the Ohio River Valley the Louisville hydro-electric station of the Louisville Gas & Electric Company closed down on March 17 when the level became too high for continued operation. It was estimated that at least ten days and probably two weeks must elapse before operations could be resumed. The company's Riverside steam plant assumed the load.

Coming Meetings

National Engineering Section, N.E.L.A.—Committee meeting, Detroit, Mich., April 3-7. B. F. Weadock, 420 Lexington Ave., New York

Maryland Utilities Association—Baltimore, Md., April 21. D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Missouri Association of Public Utilities—St. Louis, Mo., April 27-28. N. R. Beagle, 101 West High Street, Jefferson City, Mo.

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. Summer convention, Chicago, Ill., June 26-30. H. H. Henline, 33 West 39th St., New York.

Electrochemical Society—Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexington Ave., New York.

Canadian Electrical Association—Lucerne-in-Quebec, June 16-17. B. C. Fairchild, Power Building, Montreal, Que.

American Society of Mechanical Engineers—Chicago, Ill., June 26-30. C. W. Rice, 29 West 39th St., New York.

American Society for Testing Materials—Chicago, Ill., June 26-30. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Engineers' Day, Century of Progress Exposition—Chicago, Ill., June 28. G. E. Pfister, 308 W. Washington St., Chicago.

▼

Municipal Plant Held Independent in Kentucky

Holding the bond issue on the Paris, Ky., municipal plant to be not a direct obligation of the city, but payable from the revenues of the plant, the Kentucky Court of Appeals has affirmed a decision by Circuit Judge Ford that the bond issue of $150,000 voted by the citizens of Paris for the construction of a municipal plant does not create a debt in contravention of the limit fixed by the state constitution.

Kentucky Utilities Company had brought suit to prevent the bond issues on the grounds that the constitutional limit had been exceeded and that the Paris water works should be included in the reckoning.

▼

Rural Service in Michigan Was Extended in 1932

Continued progress in carrying electric service to Michigan farms was made in 1932 despite unfavorable agricultural and industrial conditions, according to a statement issued last week by the Michigan Utilities Information Bureau. Reports from electric utilities of the state show that on January 1, 1933, more than 36,500 farm customers were connected with central-station lines, this figure representing an increase of more than 2,250 over that recorded as of January 1, 1931. The actual increase in the number of farm customers was considerably greater than 2,250, since three systems operating in rural districts revised their classifications, segregating strictly farm customers from non-farmers living outside of incorporated towns.

In 1926 the utilities reported only 6,800 farm customers, or 4 per cent of the 169,372 farms in Michigan. At the present time, 21.6 per cent of the state's farms have electric service from central stations, exclusive of those with home plants of the gas engine and storage battery type.

▼

Oregon Utility Bills Finally Approved

Two of Oregon's utility bills have become laws and a third, that drafted by the state's one-man utility commission, lacks only the Governor's signature before joining the effective regulatory statutes of that state.

Before any contractual obligation may be assumed by an Oregon public utility hereafter the nature and character of the contract must be submitted first to the utility commissioner for his sanction and approval. The new law, designed to apply specifically to those holding companies that exercise the privilege of dictating the manner and method to be adopted by operators in this state in connection with new construction, extensions of service and betterments of generating and distributing systems, stands as a separate statutory provision and no attempt was made in its framing and adoption to incorporate it in the general regulatory code. Whether the public interest will be served to advantage by agreements between the utilities and contracting parties is left to the sole judgment of the commissioner, under this statute, and no operator may build new plants, extend light and power service or replace obsolete equipment by bids or otherwise to second parties without the consent of the commissioner.

Passage of the Grange enabling act enables the state to place in operation the provisions of a constitutional amendment adopted by the people last November permitting the state to develop and purchase power projects and generally engage in the electric utility business. The enabling act provides that the state may issue bonds in the sum of $65,000,000 to carry out the intent of the amendment, the bonds to draw not more than 6 per cent.

After having been shuttled back and forth between House and Senate for nearly 40 days, and receiving exhaustive consideration by at least three committees, the new regulatory bill submitted by Commissioner Thomas has been finally adopted by both houses with many amendments (ELECTRICAL WORLD, February 25, page 243). Despite the long-drawn-out arguments over the bill, its adoption does not extend any more power to the commissioner than he now possesses under the Oregon regulatory code created in 1911. The bill is now in the hands of the Governor for his signature or veto.

▼

Massachusetts Continues Smoke Abatement Work

Smoke abatement will be continued by the Massachusetts Department of Public Utilities, though a law passed last week abolishes the existing smoke division and does away with the inspection of new boiler plants from the combustion standpoint. An economy committee recommended abolishing the entire work, which now costs about $50,000 per year. The new law provides for continuing the abatement work by the commission through a new internal organization.

Since its organization in 1910 the smoke abatement staff has made about 2,500,000 observations, and atmospheric conditions have been much improved as well as economy of fuel-burning plant operation. Last year there were 231,976 observations, 1,165 violations and only four court cases. According to Director D. A. Chapman, the cost per observation is 1.1 cents per year per $1,000 of assessed valuation in the 291 square miles covered by the service in the Boston area.

▼

Alleged Sabotage Brings Anglo-Russian Discord

An exodus of foreign engineers appears to be under way from Soviet Russia. Latest reports indicate that the recent arrest and impending trial of four British engineers accused of sabotage, together with a definitely unfavorable turn of affairs, has greatly impaired confidence in the ranks of those remaining. The probability that the sabotage case will become a political row, in which foreigners will be held responsible for actions beyond their control, is said to be the basis for the change in feeling.

Though the British government has protested the treatment accorded its subjects, Soviet authorities have refused to alter their plans for action. The four engineers, employees of the Metropolitan-Vickers Electrical Company, are charged with having willfully damaged the large turbines of Dnieproges. The specific allegation is that sand or acid was poured upon the runners. So high has feeling run that the Soviet Ambassador to London has been recalled for failure to emphasize with sufficient strength the alleged justice of the Soviet cause. Anglo-Russian trade relations reached a virtual breakdown this week.

Boston Edison Net Revenue Up 1 per Cent in 1932

(Year Ended December 31)

Earnings

Gross earnings	$30,578,498
	0.8% below 1931
Net earnings	$10,847,921
	1.5% above 1931
Operating ratio	65
	Same in 1931
Depreciation allowance	$2,400,000
	7.9% of gross earnings
	0.1% of plant investment
Times prior charges earned	2.6
	in 1931, 2.3
Net balance per share of common	$12.4
	in 1931 $13.7
Dividends declared on common	$12.4
	in 1931 $13.7

Balance Sheet		Compared with 1931 per Cent
Total assets	$182,630,688	+4.0
Funded debt (coupon notes)	$75,000,000	+7.1
Capitalization	$128,487,500	+2.8
Total surpluses plus reserves	$12,467,242	+7.5
Ratio current assets to current liabilities	3.7	
	in 1931, 2.5	

Price range of common, $195 to $135 in 1932. Current price of $156 is 13.0 times 1932 earnings.

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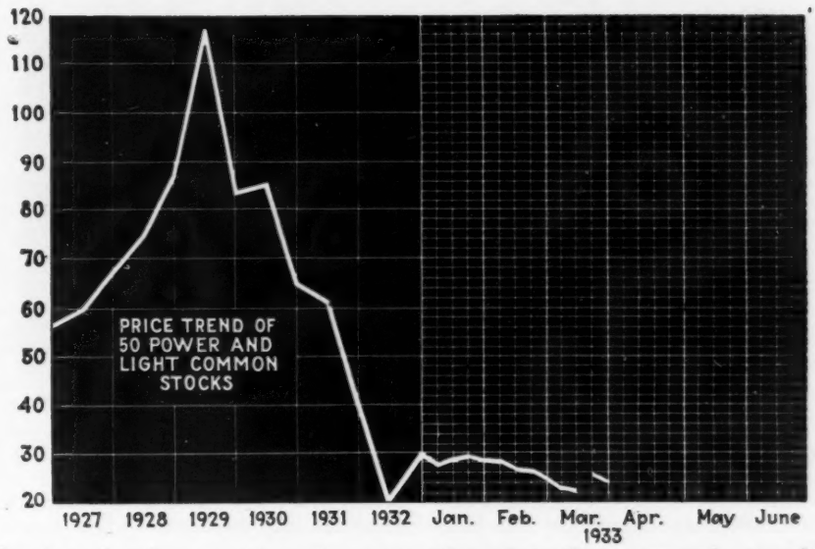
U.G.I. Praised at Hearing by Federal Trade Board

In bringing to a close the Federal Trade Commission inquiry into the corporate affairs of the United Gas Improvement Company, which started a fortnight ago (ELECTRICAL WORLD, March 11, page 307), Judge Robert E. Healy, the commission's chief counsel, paid a high tribute to the company and its officers for the manner in which they had co-operated with the commission in facilitating examination of all books and records. "At this time," Judge Healy said, "I particularly want to emphasize the fact that the United Gas Improvement Company has co-operated in every way with the commission in this inquiry. All records were handed over and we have had absolute frankness on the part of the officers of the company." Philip H. Gadsden, vice-president of the company, the last witness, testified as to the participation of the officers and employees of U.G.I. and its operating underlying units in civic activities, with particular reference to membership in chambers of commerce and other trade bodies.

At a subsequent hearing the Federal Trade Commission heard from W. B. Horne, one of its experts, that 40 per cent of the nation's electricity and 30 per cent of its gas utilities were under the control of three groups, J. P. Morgan & Company, F. L. Carlisle Company and Bonbright & Company. The three groups, Mr. Horne testified, control the United Corporation and the American Superpower Corporation, the latter owning 7.6 of the former. Companies named as controlled by United Corporation were Niagara-Hudson, Columbia Gas & Electric and U.G.I.

Stocks Decline After Sharp Rise



Surging sharply upward on the resumption of trading last week, security markets for several days showed notable strength. Later reactions in both commodity and securities lowered the averages. The "Electrical World" index receded this week to 23.5 from 24.5 last week.

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Columbia Gas & Electric Issues 1932 Report

Year Ended December 31 (Consolidated Statement)

Earnings

Gross operating revenues	$79,155,16 7
	11.5% below 1931
Net operating revenue	$26,576,18 8
	11.2% below 1931
Consolidated net income	$17,204,675
	22.9% below 1931
Balance available for common stock dividends	$11,120,027
	32.5% below 1931
Earnings per share	$0.96
	In 1931, $1.42
Surplus (Jan. 1, 1932)	$44,448,804
Surplus (Dec. 31. 1932)	40,851,861

Balance Sheet		Compared with 1931, per Cent
Plant and property	$610,920,662	+ 0.2
Current assets	23,163,105	—21.8
Current liabilities	22,591,103	—53.5
Funded debt	166,961,100	+ 5.4

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Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1932	1931	Per Cent Increase	Operating Ratio 1932	Operating Ratio 1931
Detroit Edison					
(Year ended Feb. 28, '33)					
Gross earnings	$42,777,160	$48,591,423	—12.0	72	65
Net earnings	12,125,229	17,213,429	—29.5	..	..
Net balance	5,732,951	11,206,170	—48.9	..	..
Duquesne Light					
(Year ended December 31)					
Gross earnings	25,223,690	27,805,534	— 9.3	43	41
Net earnings	14,262,919	16,355,972	—12.8	..	..
Net balance	10,458,711	12,760,700	—18.1	..	..
Kansas City Power & Light					
(Year ended Jan. 31, '33)					
Gross earnings	14,717,009	14,702,048	0.1	61	59
Net earnings	5,679,133	5,979,234	— 5.1	..	..
Net balance*	3,873,817	4,444,006	—12.8	..	..
Louisville Gas & Electric					
(Year ended December 31)					
Gross earnings	9,958,117	10,714,011	— 7.1	56	53
Net earnings	4,328,928	5,023,288	—13.8	..	..
Net balance	1,736,615	2,373,635	—26.9	..	..
Northern States Power					
(Year ended December 31)					
Gross earnings	32,338,694	34,055,868	— 5.0	60	57
Net earnings	13,033,325	14,853,384	—12.3	..	..
Net balance	2,085,297	4,037,049	—48.3	..	..

Operating Companies

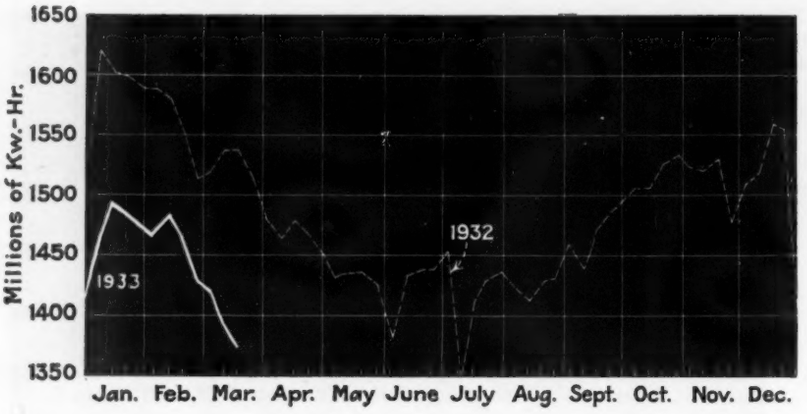
	1932	1931	Per Cent Increase	Operating Ratio 1932	Operating Ratio 1931
Puget Sound Power & Light					
(Year ended Jan. 31, '33)					
Gross earnings	$13,367,842	$15,605,720	—14.3	61	62
Net earnings	5,222,954	5,901,020	—11.5	..	..
Net balance	299,902	916,217	—67.2	..	..
Virginia Electric & Power					
(Year ended Jan. 31, '33)					
Gross earnings	15,286,508	16,875,069	— 9.4	64	66
Net earnings	5,514,129	5,689,892	— 3.1	..	..
Net balance	2,439,545	2,715,870	—10.2	..	..

Holding Companies

American Water Works & Electric and Subsidiaries					
(Year ended Jan. 31, '33)					
Gross earnings	$43,278,846	$49,425,815	—12.4	..	..
Net balance	2,257,932	5,108,265	—55.7	..	..
Philadelphia Company and Subsidiaries					
(Year ended December 31)					
Gross earnings	47,752,050	56,036,779	—14.8	65	61
Net balance	5,331,401	10,567,507	—50.0	..	..

* Available for all dividends.

Frozen Accounts: Less Electricity



Returns giving the electrical energy production during the past few weeks give evidence of the decrease in industrial activity accompanying the financial disturbances. Output for the week ended March 11, reported by the Edison Electrical Institute as 1,375,207,000 kw.-hr., was 10.6 per cent less than a year ago, thus further widening the disparity compared with 1932. This had shrunk to 4.9 per cent in the week of February 18; since then the gap has been increasing.

On the Atlantic Seaboard and in the Central industrial area the difference between present output and that of 1932 remains nearly the same as in the preceding week, but in New England, considered separately, there was an improvement. On the Pacific Coast the disparity increased from 5.8 to 6.9 per cent.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
March 18	1,375	1,538	1,682	1,722
March 11	1,391	1,538	1,676	1,736
March 4	1,423	1,520	1,664	1,750
February 25	1,426	1,512	1,633	1,744
February 18	1,470	1,545	1,680	1,746

Per Cent Change from Previous Year

Region	Week Ended Mar. 18	Mar. 11	Mar. 4
Atlantic Seaboard	— 8.2	— 8.0	— 5.2
New England alone	— 9.5	—10.4	— 7.1
Central industrial	—14.8	—14.4	— 9.6
Pacific Coast	— 6.9	— 5.8	— 5.3
United States	—10.6	— 9.6	— 6.4

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Six-State Regulation of Interstate Energy

Regulatory bodies of six states which conferred recently upon the creation of non-federal machinery for the supervision of interstate power transmission (ELECTRICAL WORLD, March 4, page 276) are now studying a tentative form of compact for this purpose. This would give jurisdiction to the signatory states by Congress to establish joint regulation and control of rates for electricity and gas transmitted between such states. The regulation in each instance is to be subject to the jurisdiction of a regulating authority to be created from time to time as occasion demands. It is planned to make this authority a temporary body, established to deal with a particular instance only, ceasing to exist when the task has been completed. In this respect the plan differs from any previously suggested.

The tentative draft of compact provides that the regulating authority shall be composed of an equal number of members from each state affected in the particular case. Such members are to be appointed from the regulatory body having jurisdiction over intrastate gas and/or electrical transmission and distribution, by the presiding officer of each such body. Such body after hearing shall have power to fix just and reasonable rates for electricity and/or gas transmitted between any two or more signatory states affected. Provision for court appeal is included and a bill has been drafted for submission to Congress authorizing states to enter into compacts for the above objects.

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Rural Line Recommendations of New Hampshire Group

Standardized methods of estimating construction costs to outside agencies, the use of 35-ft. poles on 135-ft. spacing for primary lines, designation of one representative to handle all rural service problems and other unification of policies are recommended in a 34-page report recently issued by the New Hampshire Rural Electrification Committee under the chairmanship of W. T. Ackerman of the University of New Hampshire. The lowering of guarantees is advised whenever actual construction costs fall below estimates.

Reasonable experimentation in rural line construction by utilities is favored, as is the New Hampshire Farm Bureau's five-year plan of financing extensions. To insure better service to farms the utility rural service agent is advised to offer to aid the farmer about to be connected to company lines in the wiring problems of the latter's house and premises. The report contains much useful information on rural line construction costs, surveys company practices in New Hampshire and gives data on experimental lines there and in Maine. Details are given of approved types of farm wiring entrances.

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Italy to Electrify Railways

Forty-one per cent of all the trackage in Italy will be electrified when Mussolini's present program of hydro-electrification will have been completed. The full plan for the next five years, just published, involves the electrification of the two main lines from Milan to Reggio Calabria, one passing through Bologna-Florence, the other through Genoa-Pisa; the line across the north from Turin to Trieste and the roads from the port of Genoa to the Alpine passes of Simplon and St. Gothard. Several smaller projects bring the total mileage to be electrified to 2,725, which, added to the 1,250 miles already electrified, will bring the total to 3,975, or 41 per cent of all the trackage.

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Allis-Chalmers Reports $2,955,043 Loss in 1932

Operations of the Allis-Chalmers Manufacturing Company in the year 1932 resulted in a loss of $2,955,043 after all charges, including interest on debentures, taxes and depreciation, as compared with a net income of $1,256,431 in 1931. Billings for the year amounted to only $14,764,064, as compared with $27,800,639 in the preceding year, and unfilled orders at the end of the year totaled $5,441,825, as compared with $7,889,334 in 1931. Electrical apparatus sales, states the report, were greatly reduced because of the "almost complete cessation of capital expenditures for new equipment on the part of public utilities, industrial manufacturers, steel mills, railroads and other industries."

Only $160,634 was paid in dividends during the past year, comparing with $1,815,229 in 1931. Balance of earned surplus account at the end of the year amounted to $11,724,636, against $16,840,313 at the end of 1931. Net current assets as of December 31, 1932, amounted to $25,231,426, compared with $27,430,584 at the close of 1931. Included in these figures are marketable securities, at a market value of $2,158,511.

Kelvinator Executive Says Sales Turn Has Come

Hopefully relying upon the low prevailing costs of materials and the renewal of buying activities on the part of the public in the aftermath of the banking crisis, Kelvinator announces new low prices for its entire line of household electric refrigerators with a minimum price of $97 installed.

In making the announcement George W. Mason, chairman of the board and president of the Kelvinator Corporation, states that the prices are guaranteed for 40 days from March 21 against advance due to possible effects of commodity and material price rise. Mr. Mason assures that "there is hardly room for doubt that the predicted upturn in retail sales has started."

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District Salesmen Stimulate Wiring

Some months ago a systematic survey of unwired buildings was conducted by district salesmen of the Edison Electric Illuminating Company of Boston and in the areas covered 1,746 such buildings were found, with 418 idle underground services which had been installed on a deferred-payment plan pending decision of occupants to use electric service. In eight months 134 idle services have been connected with the system and 548 buildings wired, adding 1,425 customers. A total of 2,633 letters was sent to occupants of buildings having idle services and 9,402 letters to unwired buildings. The average number of letters per prospect was 6.9. Thirty-two per cent of the idle services were placed in use and 39 per cent of the unwired buildings were wired as a result of this procedure.

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Hollywood Special Train Glorifies Stars and Kitchen

Back to Los Angeles goes the Warner Brothers-General Electric "42d Street Special" after having brought, in the best Hollywood fashion, the dual story of the new film "42d Street" and the General Electric kitchen to ingenuous America. With two-score movie stars and satellites aboard, the train, resplendent in gold and silver leaf, brilliantly lighted within and without and bearing an all-electric kitchen of special construction, smashed its way into the public consciousness.

Sponsors claim that 2,000,000 people got the message through parades in fourteen major cities, that 500,000 saw the train at its stops, that uncountable thousands saw it flash its way, a traveling signboard, through the night, that half a million people went through the exhibit and that it was a great success for all concerned.

Both sides of the train were electrically lighted with a total of 3,500 lamps, sun lamps were installed to preserve the delicate health and beauty of the stars and huge sun-arc lamps supplied by special generating equipment cast powerful colored light beams into the sky. The all-electric kitchen replaced dining cars on its two trips.

Major New Construction This Week

Installation of heavy-duty motors, controls, transformers, conveyors, hoists, etc., impends for new Cleveland, Ohio, incinerator plant. A $700,000 project.

Machine drives, motors, controls, transformers, pumping machinery and compressors will be installed at Lueders, Tex., by Freeman-Hampden Oil Corporation, Wichita Falls, Tex. Estimated cost $100,000.

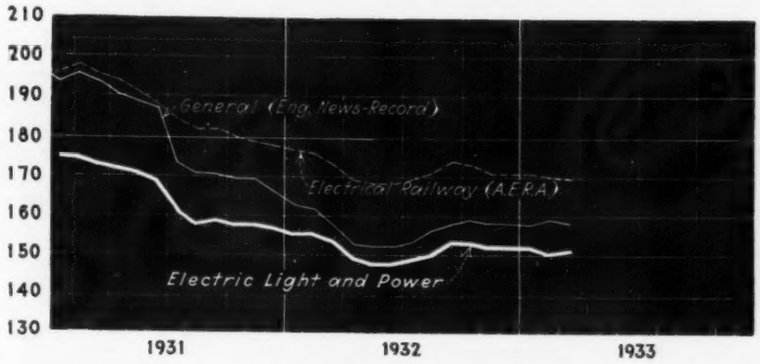
Customary electrical equipment will be purchased by Great Eastern Breweries, Inc., Manville, N. J., recently organized. A $500,000 project.

Machine drives, motors, controls, transformers, and conveyors will be installed in plant at Houston, Tex., of Continental Can Company. Estimated cost $400,000.

Bids will soon be asked by Department of Public Affairs, Newark, N. J., for electrical equipment for new city railway system, including cable, power lines, etc. Cost over $200,000. Former bids rejected.

Middlesboro, Ky., is arranging fund of $300,000 for city-owned electric light and power plant and plans purchase of prime movers and other electrical equipment.

Little Change in Construction Costs



Construction costs in the electric light and power industry, as in other lines, continue at approximately the level of the past six months, and a few per cent above the minimum of last summer. The latest index number shows a very slight upturn, following a sag of one per cent in February. The figures here given relate to the revised series in ELECTRICAL WORLD of January 21, 1933, on page 105. Electric railway index numbers have also been revised.

Construction Cost Indexes: Electric Light and Power, Electric Railway and General

Base: 1913 = 100

	Electric Light and Power*	Electric Railway*	General—*Engineering News-Record*
March, 1933....	151	170†	158.4
February, 1933..	150	170†	159.3
January, 1933...	152	171†	158.4
March, 1932....	153	173†	157.2
Last 5 yrs. high	185	205†	210.4
Month.....	Jan. '30	Dec., '29	Feb., '29
Last 5 yrs. low..	148	168†	152.2
Month.....	May, '32	May, '32	June, '32

* Computed by Albert S. Richey. † Revised.

High-Pressure Turbine for Russia

Designed to operate normally at a steam pressure of 1,778 lb. per square inch absolute and superheat of 878 deg. F. a high-pressure turbine now being constructed by Metropolitan-Vickers Electrical Company (England) for the Thermo Technical Institute of Moscow will discharge at 384 lb. per square inch to an existing steam system. The unit will be of 24,000-kw. rating.

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New York Metal Prices

	March 14, 1933 Cents per Pound	March 21, 1933 Cents per Pound
Copper, electrolytic..	5.75	5.25
Lead, Am. S. & R. price	3.35	3.25
Antimony.....	6.25	5.95
Nickel ingot.....	35.00	35.00
Zinc, spot.....	3.475	3.50
Tin, Straits.....	24.00	24.00
Aluminum, 99 per cent.	23.30	23.30

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Edison Park May Cost $2,000,000

In its second annual report to the New Jersey State Legislature the appointed commission in charge of developing the proposed Thomas A. Edison State Park at Menlo Park has estimated the total probable cost as between $2,000,000 and $2,500,000. The commission has recommended passage of a bill to be introduced by Senator Quinn permitting it to acquire, by purchase, gift or condemnation, land in Woodbridge Township as a part of a 300-acre site. The commission also urged that the $10,000 provided in the 1931 law creating the body be advanced for additional surveys and studies.

East St. Louis Rate Protest

Assailing the payment of 12 per cent dividends and alleging the cost of rendering the service, the value of the property in use and the value of the service to have decreased between 10 and 35 per cent without corresponding reduction in rates, petitioners have appealed to the Illinois Commerce Commission for a reduction in the charges of the East St. Louis Light & Power Company. The company's "power pool contract" with the Union Electric Light & Power Company has also been attacked by the protestants.

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Seattle Meets Bills of Indigent

City and county officials of Seattle have worked out a plan by which King County will assume responsibility up to $2.20 for electric light bills of indigent unemployed, or up to $2.50 where electricity for cooking is provided, and pay this sum to the City Light Department.

▼

Severn Tidal Power Scheme

Reporting upon the prospects of the tidal power project which it was appointed to study, the Severn barrage committee has pronounced technically feasible the plan to develop that English river. For seven years the committee studied the matter before issuing its final report, which is sponsored by the Economic Advisory Council. It is estimated that a yearly output of 2,207,000,000 kw.-hr. could be made available by a full development of the potentialities. The probable cost is given as $192,000,000, exclusive of $60,000,000 for altered harbor and railroad facilities.

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Foreign Trade Convention

Wide attendance by electrical equipment manufacturers is expected at the twentieth National Foreign Trade Convention to be held in Pittsburgh April 26, 27 and 28. This convention, the largest and most important meeting devoted exclusively to foreign trade, is held annually in the United States and is sponsored by the National Foreign Trade Council. Advance registrations indicate an attendance of more than 1,500. Many questions of world-wide importance will be brought before the convention including war debts, tariffs, depreciated currencies and trade barriers.

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Modernizes Lightning Protection

Following careful study of past experience, of methods of protection, laboratory tests and investigation of the economics involved, Detroit Edison Company has placed what is said to be one of the largest of orders ($40,000) for distribution type lightning arresters. Reconstruction in the expectation of large savings as the result of the adoption of the new practices is said by the Westinghouse company to have been an influencing factor in the decision to install this equipment.

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St. Charles Votes Down Plant

For the second time this year voters of St. Charles, Mo., have defeated a proposed $300,000 bond issue with which to finance a municipally owned electric light and power plant. Far from being discouraged, proponents announce that they will keep up the fight as long as the City Council will give its support. The 20-year franchise of the Union Electric Light & Power Company, now supplying the community, expired March 14 (ELECTRICAL WORLD, January 14, page 56; January 21, page 84).

▼

Utilities Would Avoid Rate Costs

Representatives of public utility companies of New York appeared before the joint meeting of the state Senate and Assembly public service committees last week to protest Governor Lehman's proposal in his budget recommendation that the cost of rate proceedings be levied against the utilities. New York City transit companies would be put out of business by any such law, the committees were told. Governor Lehman foresaw savings to the state of some $750,000 a year.

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Will Canada Export Power?

Faced with the certainty that a large part of the energy-generating capacity of the province will continue to be without a market for its output in the immediate future, the long and acrimoniously discussed question of to export or not to export power is once more debated in legislatures. The Quebec provincial Minister of Lands and Forests has introduced a bill to permit export to the United States and the ultimate consent of the Dominion government is anticipated. Annual licenses are issued by the federal government for the export of energy.

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Maryland Merger Economies

Coincident with the taking over of the property of the Annapolis & Chesapeake Bay Power Company on March 15, Consolidated Gas, Electric Light & Power Company filed with the Maryland Public Service Commission an extension of its rate schedules to apply to the territory served by the Annapolis company. A saving of some $222,000 a year to consumers is said to be involved (ELECTRICAL WORLD, October 8, 1932, page 485).

Would Preserve Ozark Beauty

In a special message delivered personally to the Missouri General Assembly Gov. Guy B. Park last week urged the enactment of legislation to control the development of hydro-electric power plants within the state to preserve and protect the natural beauty of Missouri's Ozark streams "from indiscriminate acquisition and spoliation for mere commercial purposes."

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British Associations Conjoin

Under the name of Conjoint Conference of Public Utility Associations various British national associations representing electricity, hydro, traction, gas, water and similar interests have combined under a written constitution to set up a defensive, and if need be offensive, alliance to safeguard their common interests. An aggregate capital interest of nearly $5,000,000,000 is said to be involved. Lord Mount Temple has been made the first president.

▼

G. E. Employees Protected

Approximately 24,700 employees of the General Electric Company are holders of G. E. Employees Securities Corporation bonds of a face value of $34,000,000, according to the tenth annual report of the corporation. Assets on December 31, 1932, were more than $70,000,000 at approximate market prices, while the total value of all bonds outstanding and current liabilities was less than $41,000,000. The corporation is still the largest stockholder of the General Electric Company, owning 495,192 common shares, or about 2 per cent of those outstanding.

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Kansas-Doherty Ban Raised

Under a temporary permit issued by the Kansas Charter Board, Henry L. Doherty & Company have won the right to sell $10,000,000 of Cities Service Company securities in that state (ELECTRICAL WORLD, March 18, page 344).

▼

Youngstown Rates Assailed

Estimating the costs of serving residential and retail commercial customers of the Ohio Edison Company to be about $290,000 below the company's estimate of $1,373,000, Youngstown, Ohio, city engineers have reported to City Council and recommended that an effort be made to secure reduced rates for small commercial consumers, who, they said, are bearing "an undue portion" of the expense. The report did not cover domestic rates, but the engineers told the Council that upon the basis of the new cost figures the company could have made the same earn-

ings that it reported for 1931 by charging consumers 4.5 cents per kilowatt-hour instead of 5.5, the existing rate. It was recommended that a generating station, which in the opinion of the engineers would never be used again, be written off the books. C. S. MacCalla, general manager of Ohio Edison at Youngstown, told Council that a lower rate than the 5.5 cent base now in effect would force the company into insolvency.

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California Utilities Aided Communities After 'Quake

Further reports from the earthquake section of California (ELECTRICAL WORLD, March 18, page 337) show utility companies to have surveyed their injuries and to have repair and replacement work well under way. Relief to communities where gas service was suspended due to fire hazards has been pushed and many ranges installed. Emergency equipment was distributed.

Total damages to the properties of the three major utilities involved, Southern California Edison, Los Angeles Gas & Electric and Los Angeles Department of Water and Power, will not, it is estimated, exceed $250,000, though the property investment endangered was about $235,500,000.

Southern California Edison Company first estimated its damages at $150,000, but according to Fred B. Lewis, vice-president and general manager, this may be less. Long Beach station was unaffected by the quake; the turbine in service at the time of the shock continued to operate and a second turbine was quickly brought into service to meet additional load requirements. Electric service briefly interrupted in the communities involved was restored quickly. In Long Beach virtually all city circuits were working after an interruption of 4½ minutes. In Compton service was restored in 47 minutes. Many lines were down throughout the city.

A relatively small amount of the damage to Edison property was to buildings, most of the loss being in connection with the damaging of outdoor equipment such as switchracks, transformers, loss of oil and damage to batteries. The only damage to the Long Beach steam station was outside of the steel and concrete buildings and totaled approximately $25,000. The greater part of the damage here, as at Lighthipe substation, was to the 220-kv. bus structures.

Commercial offices were damaged and that at Compton probably will have to be razed. The others can be repaired. Damage to the Long Beach office was confined to the front of the building.

Los Angeles Gas & Electric Corporation's loss is between $75,000 and $100,000. Virtually all of the major damage suffered was at the Seal Beach steam-generating plant. Principal damage was to walls of the building and to one generator unit. In addition to wall breakage, a part of the structure foundation apparently settled, causing the shifting of the generator spindle. It was estimated on March 16 that this equipment would be restored to service in about three weeks.

The Los Angeles Bureau of Power and Light reported insignificant damage, probably not exceeding $2,000. There was slight damage to a penstock at the San Fernando hydro-electric plant, some lines broken in the Los Angeles Harbor area and approximately 3,000 out of 88,000 street lamp globes were broken. No estimate had been made of the loss in street lamp glass breakage.

Performing outstanding emergency relief service, electrical cooking and heating equipment provided indispensable hot food and comfort for thousands of persons whose homes in Long Beach, Compton and other communities were damaged. Relief camps, hospitals and first-aid stations and temporary homes in tents and garages utilized electrical equipment extensively to meet the extraordinary requirements that came with the disaster.

Relief service rendered

Because of the necessitous shutting off of the Long Beach municipal gas supply, due to the fire hazard, one of the first needs of the shaken city was for cooking equipment. Electric ranges already in service in homes and institutions went on community duty. More than 100 Edison company employees living in the city threw open their homes, with their electric ranges, for the use of distressed neighbors. Truckloads of electric ranges from Edison company warehouses moved quickly into Long Beach and Compton and installations were being made by six gangs of Edison service men with the coming of daylight after the quakes. supplies of hotplates, air heaters, heating pads and other appliances moved almost continuously into the damaged towns. Stocks of many appliances, particularly hotplates and small air heaters, were quickly exhausted in Los Angeles and neighboring towns and supplies were replenished from other cities. Approximately 100 electric ranges had been installed 72 hours after the quake.

Southern California sent other supplies into the shaken areas for the relief of the homeless. Tents and a rolling kitchen, used by the company in its construction camps, were sent to Long Beach and Compton for the use of organized agencies.

Electric ranges served emergency community hospital

EDITORIALS

L. W. W. MORROW
Editor

An All-Electrical Convention at Chicago

AMERICAN industry must reorganize, consolidate and co-operate. This is the problem of the electrical industry which emphasizes the fundamental interdependence of the manufacturers, utilities, wholesalers, contractors and retailers. The problems and the opportunities have outgrown the interests of any group and the road to prosperity lies in collective action. The need for co-operation has grown steadily and is now acute in this period of drastic deflation.

Why not, therefore, have an all-electrical industry convention early in the summer in connection with the Century of Progress in Chicago? A joint committee of the several trade associations should formulate the program. The basis of the meeting would be an open forum, wherein each group presented its story of conditions encountered, told the plans for its own development and made suggestions for industry joint action. These reports would lead, first, to mutual understanding and, second, to an all-industry program for internal improvement and market development.

Manufacturers have points of view on unfair competition, trade practices, price cutting, quality appliances, organization for sales and opportunities for joint action in market development. Utilities can indicate their problems in finance, rates, competition, purchasing and organization and state their ideas of collective action for industry improvement. The wholesalers, the contractors and the retailers have equally definite problems and conditions and can contribute very valuable and practical suggestions for collective action.

This clearing house meeting would permit the power of co-operation to be wielded based on an understanding of the conditions faced by each industry group. It would permit each group to reorganize and go forward along the common road. There would be no threatening of the common interest by unwise individual trade association activities. There would be given a powerful impetus to industry progress.

Self-regulation of the industry, a unified front in market development, an understanding of the part each group plays and should play in the industry organization and the bringing into play of teamwork both for survival and for security prosperity—these are the reasons for this industry convention. There is no other light to guide the industry but co-operation. Who will take the lead in calling this most vital convention together at the Century of Progress?

Supreme Court upholds co-operation

THE Supreme Court has extended the old "rule of reason" to include co-operative efforts in the most significant Appalachian Coals case. A combination of competitors may do anything that would not be considered unreasonable restraint of trade if effected by an actual merger. Industry is encouraged to regulate itself, for the court says: "The fact that the correction of abuses may tend to stabilize a business or to produce fairer price levels does not mean that the abuses should go uncorrected or that co-operative endeavor to correct them necessarily constitutes an unreasonable restraint of trade."

This decision opens the door to permit a combination of competitors, through a corporation or a trade association, to stabilize their industry

within certain bounds. It is significant in the philosophy involved and in the opportunity it presents for groups in the electrical industry to co-operate to get both stabilization and market development. Compilation and exchange of information are legal and power may be granted a directorate even though fairer prices result. The court says: "Putting an end to injurious practices and the consequent improvement of the competitive position of a group of producers is not a less worthy aim and may be entirely consonant with the public interest, where the group must still meet effective competition in a fair market and neither seeks nor is able to effect a domination of prices."

This decision is most significant to business and affords a guide to the suggestions for co-operative action made in this issue.

Free wiring for sales

SELF-LIQUIDATING projects are in favor as unemployment relief and business-stimulating agencies. What has the electrical industry to offer? Home electrification offers the best opportunity, both because this involves the entire nation and because it is a very practical business suggestion. Labor, contractors, wholesalers, manufacturers and utilities would all gain through development of the domestic market and householders would get increased comforts and conveniences.

Suppose, for example, the industry united to underwrite adequate wiring for all homes as a sales inducement to the purchase of more electrical products. Labor wishes work and might lower its unit rate to get a greater total income as its part of the plan. A corporation might well be formed to handle the wiring cost on an amortization basis with the utilities, manufacturers, wholesalers and contractors, each underwriting the securities and each contributing a proper share of fixed charges.

With this united industry credit corporation as a background and an adequate organization all sales agencies could approach householders to buy and use more electrical products and service at no expense for wiring changes. This plan would overcome the present inadequate wiring handicaps and give a purchasing inducement to prospective buyers. It would afford more employment to labor and more business to all branches of the industry, and the cost would be a small but definite part of the costs of the business enterprises associated with the plan. The present spasmodic adequate wiring campaigns and the non-uniform practices of present sales agencies with respect to wiring costs would be eliminated and the free-wiring corporation could present an industry agreement and factual data to show that this self-liquidating project is far more meritorious than reforestation, hydro plants and other projects now seeking support from the Reconstruction Finance Corporation. The industry might well study this and other self-liquidating projects as a part of its contribution to unemployment and business revival.

How to live with science

LONG-TERM financing in a rapidly changing world was cited as an important causal factor in the present social and economic confusion by Dr. F. B. Jewett, president of the Bell Telephone Laboratories, in a recent address. When scientific research was desultory and individual, and therefore slow to result in application, conditions of business and of living were so slowly evolutionary as to be, for practical purposes, static. But organized research, with its methodic attack on the unknown, has displaced evolution with revolution in the material things of the world, and the movement is, and has been since the beginning of the nineteenth century, too fast for social and economic concepts to keep pace with it.

Some means must be devised to bring the social, political and economic aspects of living abreast with the progress of science and to keep it there. For research is not going to stop as long as the unknown remains unknown, as long as men have curiosity to investigate it and as long as the competitive rewards of investigation hold their allure. Dr. Jewett said that science can be terrible and may become so if a satisfactory revision is not found for the present maladjustment. Since scientific research became methodized there has arisen the possibility of a complete reversal of conditions of life. Up to 1800 the physical drudgery of the many supported the few in idleness. If all the tools put into our hands by science were now completely utilized the intellectual drudgery of the few could support the many.

Collective Action for Profits

By L. W. W. MORROW
Editor, ELECTRICAL WORLD

Suggestion for local group action.
Wholesalers should define their functions.
Manufacturers should strengthen their trade association.

BUSINESS faces a crisis in management. Each management, however, quickly finds that the solution to many of its problems necessitates joint action with other business managements. This forces a union of executives of similar enterprises and, in addition, necessitates co-operation with other industry groups operating under similar national conditions. Curbs on competition, collective action in sales, uniform policies and practices and many other aspects of business call for joint study, collective action and centralized control and guidance. The logical agencies to use for this co-operation are the trade associations. They already have made a start toward the fulfillment of current industry requirements and obligations and can be developed quickly and economically.

From one point of view the object of joint action is to get the solutions to production and marketing problems in order to make profits, but in a more vital and broader sense collective action is needed to integrate business with our modern civilization. For very definitely modern business has reached a stage of development whereby it must work out its own salvation and consciously take its proper part and responsibility in national affairs. Business has survived the incompetent attempts of religious, legal, economic and political leaders to control or direct its activities, but this depression shows that business must now act for itself. It must make its own destiny as a social and economic part of modern democracy, because the only alternatives are destruction or government ownership and control.

The crisis in management, therefore, is one of social responsibility as well as one of economic survival. Self-preservation forces trade association regulation and control, but good citizenship requires also that social control be instituted. Business must act on such matters as a better balance between the production of the several kinds of goods and their consumption; a better decentralization and diversification in industrial areas to maintain stable work, production and consumption; to limit capital extravagance and credit extravagance and prevent waste, and to create and maintain higher standards of living. Maladjustments and unbalances in business are as serious as the excessive accumulation or expenditure of capital or the development of a highly speculative security market in their social and economic influences. Business is the fundamental aspect of modern democracy, and temporary exploitations and unbalances must not occur because they jeopardize the national welfare.

Function of trade associations

Thus the ambition of the trade association is to be the agency through which an industry group reaches an understanding, a commitment and an enforcement of policies and practices essential to existence and progress. It must act to protect and defend an industry from external injuries; it must protect and shield its group from the unwise actions of individual members; it must aid its group in the marketplace to sell more abundantly and more economically in competition with other groups, and it must join with other trade associations in the development of business policies and practices that will bring both profits to the participants and contributions to national welfare.

Past activities largely defensive

The trade association was organized largely as a defensive measure to protect the so-called vested interests of individual members. It gradually developed standards for manufacturing, uniformity in accounting, a code of business ethics and, in some instances, selfish price agreements that brought about anti-trust legislation by the government. Most of this work has been necessary and valuable and should be continued. But even in these activities results were obtained only by a casual and slow voluntary co-operation. There was little centralization of power to enforce discipline, to get quick action or to make all enterprises in a group conform to the policies and practices agreed upon by the majority. Only minor attempts were made to institute controls, force the submission of complete statistics and actively develop trade extension and marketing programs. Even in the gradual development of co-operation between trade associations there has been little progress, because participating groups did not have the power of commitment or enforcement.

As a consequence of this type of historical growth we find several trade associations in the electrical industry, each developed largely for defensive purposes by the individual groups. One serves the manufacturers, another the wholesalers, others the several kinds of utilities, another the contractors and others have been formed in the retail fields. In addition there are local and national associations that serve functional men or local needs, such as engineers, inspectors, insurance companies, purchasing agents, statisticians and local community sales outlets.

These are the present agencies available to improve the status of the industry by joint action within each group and between groups. No one of these contains a complete group membership and no one of these has sufficient centralized power. And although some attempts have been made to get joint action of the several trade associations—for example, the Society for Elec-

trical Development—little has been accomplished. Yet all groups in the industry have a common objective. They wish to advance the interests of the entire industry by establishing facts, policies and practices that will bring progress and profits to all participants. Thus, especially in the present crisis, the trade associations have an opportunity to strengthen and revive their efforts to be a positive instead of a negative force in industry advancement.

View the markets first

All trade associations should form their programs and organize their activities by first getting market facts and conditions, because the goal of industry is to make profits by selling goods and services. The electrical market data are well known. We know the degree of saturation for each locality and for each product, the present sales density and volume by products and areas, the purchasing power of consumers for all kinds of prospects and their present purchases and, in fact, everything that is necessary to establish national sales programs and economical sales mechanisms based upon selective marketing, multiple selling and the creation of consumer demands. These market facts show that present markets are saturated to only about 40 per cent of their present possibilities. Studies also show the business prospects for the sale of new products, such as air conditioning, and further observations warrant the prediction that many other new products and services can be counted upon in the future as the result of research and invention. The total figures for prospective and immediate sales are so large as to be almost incredible. Yet, despite these market conditions, the electrical industry records a general deficit for operations and has slowed up in its rate of selling the markets. The logical conclusion is that this is the fault of management and that improvement depends upon the effectiveness with which present managements bring not only their individual, but also their collective efforts to bear to get profitable sales to these markets.

Group action by retailers

A multitude of retailers is encountered in the first step from markets to production. In the electrical industry these include door-to-door canvassers, electrical stores, radio stores, contractor-dealers, utility stores, departments of drug, hardware, general merchandise, furniture, automobile, jewelry and radio stores. These sell consumer goods. In addition there are special distributors, district agents, specialty salesmen and factory salesmen for capital goods. All these outlets seek to do business at a profit and compete with each other and with outlets of other industries in local markets. There is little organization, little joint action and little profit. The cost accounting and bookkeeping to apply to get selective marketing and multiple selling by each agency is absent. There is no allocation of territory or products and there is no control of individual policies and practices. The manufacturer and the jobber invade the retail field at will either by purchase of some outlets, by direct competition or by indirect control, and each retailer is in a continual battle for survival. Many conditions he encounters are beyond his control and a minimum of his effort is devoted to intelligent and planned trade extension programs. Conditions differ in each locality and local traditions and the variable character of local executives are dominant influences, but in general the retailers are unco-ordinated parts of individual vertical organizations.

Local joint action essential

To get more business and to make more money, with a full consideration of these facts, managements must unite for joint action in each local market area. These local groups should in turn be related to national trade associations in order to develop national policies and practices.

What things may be done by local groups in the electrical industry? Premised upon more and better business a typical joint action program would be as follows:

1. An analysis of the local market for all electrical products by classes of customers, by definite location and by magnitude of present and possible purchases. This record is the basic and continuous inventory record upon which to build plans.
2. An analysis of present retail outlets to get the amount sold, where sold, the products sold, the method of selling and the other data to give retail trade statistics.
3. An analysis of the purchasing practices of local retail outlets to get definite data on where purchases are made, in what amounts, on what credit and margin terms and the other information necessary to an intelligent study of purchasing, inventory and credit policies and practices in the local area.
4. A study of accounting used in retail sales and the development and institution of a uniform accounting and bookkeeping system that includes sales accounting.
5. The development of local policies and practices in retail sales so that all may compete on a fair basis as to both purchasing and selling.
6. Creative consumer demand and sales programs so planned and timed that all participants may make profits at a minimum cost consistent with their individual efforts.
7. A local committee to study legislation, code and other semi-legal aspects of retail sales that may help or handicap market development.
8. An analysis of costs of marketing to establish guides and principles whereby each retailer will work on a selective marketing and multiple selling basis to maximum advantage and secure maximum profit.
9. Development of policies and practices with respect to dealing with wholesalers, distributors and manufacturers so that improvement will be had in these relations and uniformity secured in purchasing policies and practices.
10. A centralized control bureau to deal with trade practices, consumer and retail outlet credit, uniform accounting, statistics of markets and of sales and relations with other local organizations.

It seems a formidable task for a local group of retailers to undertake this work, yet each individual must do similar work if he is to survive, and the joint action is required to get inexpensive, rapid and profitable sales in each market area without wasted efforts and financial losses. Retailers can no longer sell blindly, sit in stores or offices awaiting casual customers or make individual canvasses and sales programs if they wish to make profits. They must become informed and aggressive merchants and exert continuous and collective sales pressure on prospective purchasers. They must establish their own policies and practices and demand from manufacturers and wholesalers those things needed to enable them to compete fairly and sell rapidly and economically.

Wholesalers at low ebb

In the distribution chain the wholesaler or jobber comes next to the retailer. There is no clearly defined group in this market area wholesaling field. The jobber, the distributor and the district office of the manufacturer serve this purpose partly and often the retail functions

as well. In straight line distribution the jobber is the logical market area wholesaler, yet these outlets are in a low state of prosperity and have not developed as they should. This has not been their fault, but, forgetting the past, the jobber now has an opportunity to serve profitably and to develop as an essential part of the sales mechanism.

Jobbers or wholesalers of all electrical products in a market area should unite to study their common problems and, in addition, they should support and participate in the work of their national trade association. There is a need as well as an opportunity for the jobber to define his functions and to establish his policies and practices as a necessary agency between retailer and manufacturer.

Some of the activities of jobbers that warrant trade association study and action are:

1. Based upon a survey of markets on a selective marketing basis, what products are available for the wholesaler to sell?
2. Based upon multiple selling, cost accounting and selective marketing, what products should be sold by the jobber to retailers? to large industrial and utility consumers? to small consumers?
3. What should be the policies and practices of the jobber in purchasing? in selling? These problems involve margins, volume discounts, warehousing, credit, purchase terms, sales terms, dealer sales aids, manufacturer sales aids, multiple product selling, cost accounting, sales control and selective marketing.
4. What should the jobber do to expedite market development and to institute sales programs in a market area and how should he do this work in order to make money?
5. How can the jobbing group determine its functional field for sales activities and limit the work of members to these confines as well as force the manufacturer and retailer to grant the jobber his economic field in the distribution mechanism?
6. What relation should the jobber have to the development of basic national sales policies and practices such as codes, inspection, quality of products, kinds of products, sales programs, pioneering of new products, advertising and direct mail sales efforts and specialty distributors?
7. What is the policy to follow, from the jobber's point of view as an economical unit in distribution, with respect to the growth of the chain jobber, the independent jobber, the specialty jobber and the owned jobber so that in each area and as a whole the wholesaling function can work to best advantage in market development?
8. How can the jobber unite with dealer and manufacturer in planned and timed sales campaigns and in the creation of consumer demands? What should be his part in these activities?
9. Can the jobber departmentalize to sell supplies, engineering equipment, lighting equipment and merchandise economically and effectively as an area wholesaler?
10. What statistics of jobbing should be compiled and how should they be used to get rapid and economical market development as well as to give the members sales control?

Undoubtedly the jobber has been squeezed severely in the past and no group needs the powerful and aggressive action of a trade association more than this group. They must act as individuals and as a group to define their function or they will be eliminated.

Manufacturers the key group

The paramount agency to stimulate and make sales and to establish policies and practices is the trade association of the electrical manufacturer. Its members make the products, have a national as well as a local point of view and have the credit and prestige to assume the leadership in market development and trade extension activities. A gradual development has occurred so that the present National Electrical Manufacturers Association is already established as a going institution with a creditable record of accomplishment. It is ready as a nucleus to be built into the modern trade association needed for industry progress through joint action. It does not, at present, include all the manufacturers and it does not have the power, unity and scope of activities needed to meet existing conditions to best advantage. It has made a good record in standards, in factory cost accounting, in the start of statistics and in the discussion of policies and practices and is ready to go forward.

To be effective this trade association must embrace the large majority of electrical manufacturers, each of which makes definite commitments and grants power to the trade association directorate. In addition the organization should be decentralized on a product group basis for certain activities and on classes of markets for other activities, while at the same time provision must be made for a central clearing house and control that will function under a strong trade association management.

Some of the definite commitments of members of this trade association to make to its management are:

1. Power to discipline members who violate sound business practices.
2. Power to commit manufacturers to joint policies and practices developed through joint action with other trade associations.
3. Power to develop adequate statistics needed for sales and balance and the enforcement of standard cost accounting in production and sales.
4. Power to bring joint action to bear on market development and trade extension both for the creation of consumer demand and the sale of products.
5. Power to study and define the functional field of activity for manufacturers with respect to sales and the power to enforce these limitations based upon facts that give definite economic proof for limits to selective marketing and multiple selling.
6. Power to study and fix policies with respect to patents, quality of products, legal codes, insurance of many classes, legislation, purchasing practices, sales practices and other needed internal and external factors that affect the prosperity and sound business practices of members. All these things must be within the law and in the public interest.

The manufacturers must work with other electrical associations and with groups outside the industry that sell the same buyers. Individual members must unite for defense and offense in order to maintain both a sound internal condition and retain or advance the competitive position of the electrical industry in the markets. They must work out the economical trade channels and limit activities of the several industry groups to their proper channels while aiding them to develop their full sales possibilities.

The trade association management must measure national industry trends and conditions and inform its members of these trends. The basic business and market statistics of the industry, both developed from reports of member companies and from outside sources, should be secured, studied, interpreted and disseminated promptly in usable form. The handicaps to industry market development, both internal and external, should be found and removed. The good name and reputation of the industry should be protected both against internal actions and external actions that are destructive.

In the internal aspects of association work there is need for working out and instituting common policies and practices with respect to such problems as patent protection, patent pooling, licensing plans, unemployment plans, cost-finding, budgeting, pricing practices, credit practices, standards of manufacture, tariffs, taxation, local and national legislation and many other current problems. These matters should be studied, a policy

stated and an enforcement of good practices instituted.

In the future also a primary work of this trade association should be to aid members to increase sales or to make sales more profitably. This realm of market development and trade extension has been neglected greatly in the past, but now it is of paramount importance. These activities lie in the development of policies and practices in production and distribution that will advance the status of the electrical industry in its marketing and calls for a great amount of joint action with other electrical trade associations.

Study should be made of national market data and market conditions first, next comes a study of the facts and conditions that now prevail in distribution and production for these markets and, finally, comes the development of policies and practices that will improve and expedite marketing. Joint action for the creation of consumer demand, for sales, for campaigns to sell one or more products at a certain time, for the development of the proper relation to agencies in local market areas so that the aid of the manufacturer will be most effective—there are many definite things that this trade association can do to bring into play—discipline, unity of practice, decentralization, diversity, selective marketing, statistical controls and multiple selling—so that all branches of the industry can unite with a common policy for market development. The manufacturer understands the business aspects and technical features of productive and marketing best and has most at stake in developing good business policies and practices. The trade association of this group should take the lead in the one great problem and opportunity of the entire electrical industry—greater and more profitable sales to the electrical markets.

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Spiral Grooving Aids Commutation Sometimes

By R. H. PARRISH

San Antonio, Tex.

Good commutation can occur only when the current undergoing a change of direction is uniformly distributed over the brush surfaces. An imperfectly fitted brush riding on an apparently smooth commutator makes contact at comparatively few and regular points. These points carry all the current, tending to heat and expand, thus slightly lifting the brush. Due to this heating the brush resistance decreases, causing the points to carry even more current, thus aggravating the condition.

By cutting a spiral groove in the surface of the commutator approximately $\frac{1}{8}$ in. deep and with a pitch of about one-half a brush width the surface under the brush is no longer continuous, which results in new and changing points on the brush surface being brought into contact. Even though the actual area of the commutator surface is decreased, it is more effective due to more uniform current density over the brush contact surface. Grooving in this manner has been found to prevent glowing at the brushes and has resulted in the commutator and its windings running five to ten degrees cooler. It is also a possible preventive of flashing over, the commonest and most serious form of bad commutation.

This form of grooving should be distinguished from undercutting commutator mica, which if done when soft brushes are used may cause trouble due to collection of conducting dust in the groove. Sometimes a harder brush that will wear down the commutator mica is better than slotting for this reason. Brush selection, good commutation and whether to groove a commutator is not determined by any one factor alone, but by getting best commutation without other troubles.

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Novel Lighting in Pittsburgh Night Club

Tubular ceiling lamps, provision for indirect lighting, floodlighted dance floor and spot lamps with color wheels recessed in floor are some features of the "Chatterbox," one of the rooms at the William Penn Hotel, Pittsburgh, which has been redecorated for a night club. The decorations were developed by Joseph Urban, well-known architect, using his characteristic color treatment throughout.

In the particular section shown a floral design in gold on a buff-cream background is banded by stripes of blue, yellow, red, black and white. For general lighting at each outlet two 40-watt T-12-bulb, all-frosted "Mazda" lamps, 34 in. long, are used. These are supported by a simple fixture produced by Cox, Nostrand & Gunnison. Half-cylinder enameled metal caps with clips at each end are provided for use when indirect lighting is desired. The dance floor is floodlighted from four corners in amber. In the parquet floor will be noticed two of five circular holes. These are covered with plate glass and have beneath them spot lamps with color wheels. The orchestra is spotlighted with unmodified light from concealed units.

D.C. Pilot-Wire Loop Protects 66-Kv. Cable Circuits

By J. H. NEHER
Engineering Department, Philadelphia Electric Company

WHEN the backbone of the Philadelphia urban transmission system (Fig. 1) was first installed the 66-kv. lines and cables were equipped with duplex impedance relays arranged to afford protection against both phase and ground faults. While this protection functioned selectively during practically all the system faults experienced, the clearing times in the case of ground faults proved to be undesirably long. This was especially true of faults on the 66-kv. cables, where, in some cases, a certain amount of synchronous load was lost.

This experience indicated the desirability of improving the ground fault protection. Since the lines are not operated in parallel (with the exception of the Richmond-Trenton lines) balanced-current relays could not be used. But due to the fact that the system is solidly grounded at all stations and substations, instantaneous directional overcurrent and directional inverse-time relays installed in the residual circuits were applicable to the overhead lines. Each instantaneous directional overcurrent ground relay is set slightly higher than the maximum current which it can experience on a through ground fault with any possible system set-up, and the inverse-time relays are selectively set on a similar basis, taking into consideration the effect of the instantaneous relays in cutting off the time curves for currents in excess of their settings. This relay combination functions in a manner similar to a step-by-step distance relay with the exception that the range of the first step and the timing of the second step are not constant, but vary with the system set-up.

Over-all protection developed

Unfortunately, this simple relay system is not applicable to the 66-kv. cables due to their relatively low reactance, which makes the ground currents obtained for faults in the cables largely dependent upon the system set-up and little affected by the distance of the fault from the relay. As a result, some form of over-all protection was necessary to obtain the rapid fault isolation desired.

The type of over-all protection employed (Fig. 2) compares the relative directions of fault current at the two ends of each cable by means of a d.c. pilot-wire loop, which is arranged to trip both ends of the cable when the fault current is into the cable at both ends simultaneously. This condition is an indication of a faulty condition of the cable. The transmission line is provided with a directional relay at each end, made directional toward each other, and a simple d.c. telegraph circuit is set up between the line ends, in which the conventional keys are replaced by the contacts of the directional relays and the sounders are replaced by auxiliary relays arranged to trip the circuit breaker. Since all parts of this telegraph circuit are in series, current can only flow when both directional relay contacts are simultaneously closed, and hence the tripping relays can operate only under this condition. In the case of a through fault the contacts of one directional relay will be open and tripping is prevented.

Such an arrangement gives the same results as the

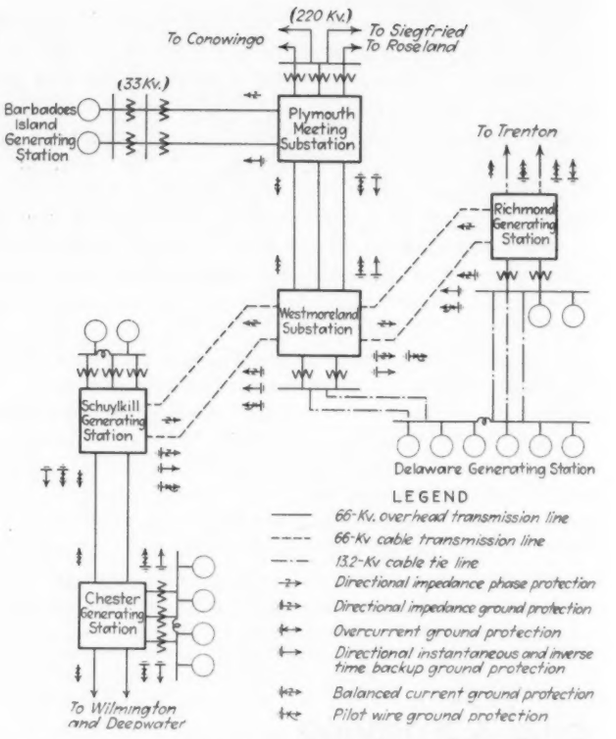


Fig. 1—Relay protection of backbone of Philadelphia urban transmission system

Consists of a number of 66-kv. overhead transmission lines and single-conductor underground cables interconnecting the steam-generating stations and tying in at Plymouth Meeting substation with the 220-kv. transmission lines from Conowingo hydro station and the Pennsylvania-New Jersey interconnection. This 66-kv. transmission system also ties in on the north with the Public Service Electric & Gas Company system at Trenton and on the south with the Deepwater Operating Company through the Delaware Power & Light Company system at Wilmington.

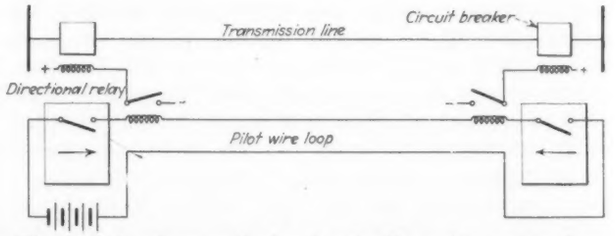


Fig. 2—Fundamental circuit of pilot-wire protection

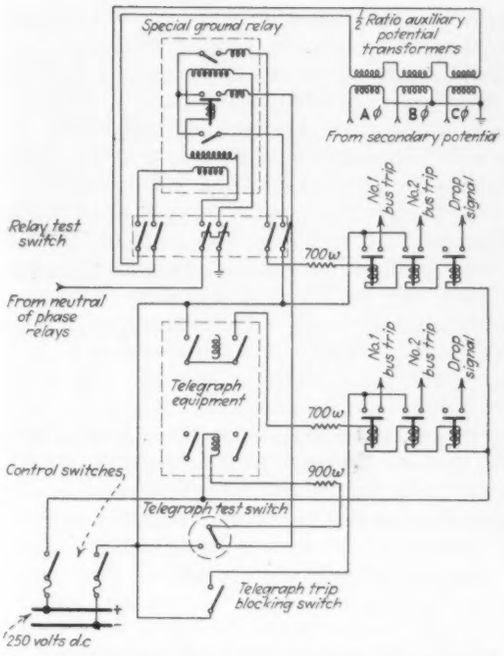


Fig. 3—Secondary and control connections of directional overcurrent ground relay and telegraph equipment

The connection from the directional relay to the telegraph equipment is made through a two-way key switch which is normally in the position shown. This switch enables the manual operation of the telegraph equipment for test purposes without interfering with the back-up function of the directional relay. When thrown to the other position it disconnects the telegraph equipment from the directional relay and connects it directly to the source of feed, which causes the circuit-closing relay contained in the telegraph equipment to operate. A blocking switch in the trip circuit of the telegraph equipment permits the testing of the pilot-wire system without tripping the line when this procedure is desirable.

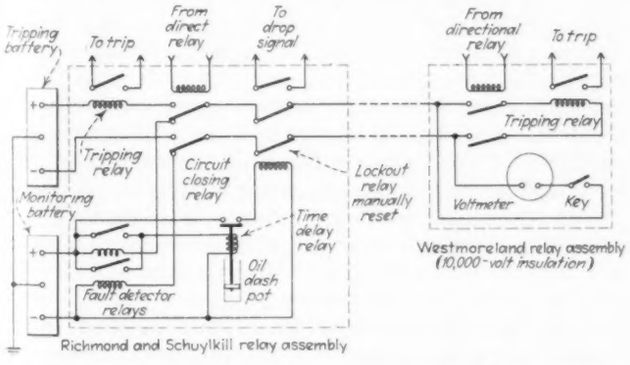
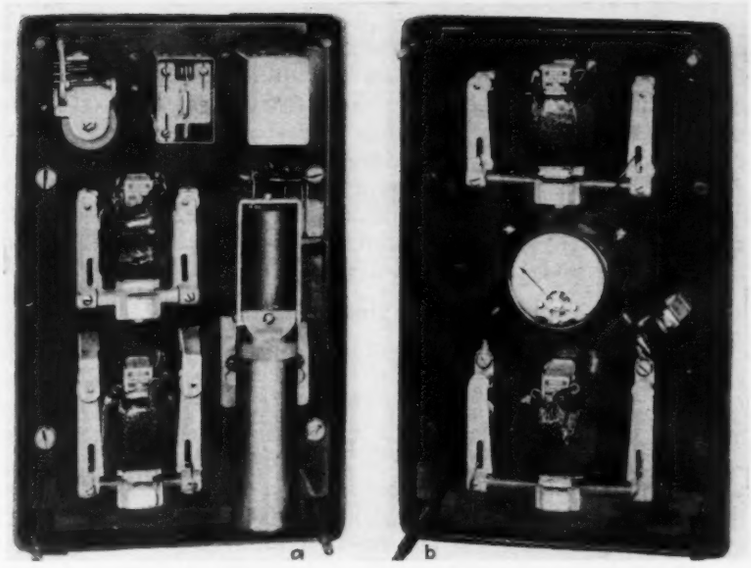


Fig. 4—Arrangement of associated telegraph circuit



Figs. 5 a and b—Telegraph relays used at battery and remote ends of pilot-wire loops

conventional system of differential protection using a number of a.c. pilot wires and has the advantage that not only are fewer wires necessary, but the two wires required are independent of the secondary current circuits at the cable ends. As a result, not only are high-current transformer burdens and sensitive current or voltage balances avoided, but the additional advantage is secured that a leased telegraph or telephone circuit may be employed as the pilot wires. This last point was of considerable importance in applying over-all protection to the single-conductor cable lines due to the fact that pilot wires, whether a.c. or d.c., could not be safely operated in close proximity to the cables due to the voltages to ground induced in the pilot wires by fault currents in the power cables. This prevented the use of adjacent ducts in running the pilot wires and made the use of a different route necessary. This different route was most economically obtained by the use of telegraph circuits leased from the local telephone company.

The component parts of this method of protection consist of a suitable directional relay system installed at each end of the transmission line and a telegraph system interconnecting them. In the design of the Philadelphia Electric Company's installations these component parts were treated as separate units.

While a number of directional relay arrangements are suitable for obtaining protection against all types of faults, it was decided that for the particular case protection against ground faults was sufficient. Due to the fact that the lines are single-phase cables, the only possibility of having a fault within the over-all protection which does not involve ground is the remote case of a flashover at the cable potheads or on the conductors in the short distance between the potheads and the oil switch. Since some simplification of the directional relay equipment was possible if the over-all protection was afforded only for faults involving ground, and since the impedance phase protection of the lines had to be retained to take care of phase bus faults in any event, it seemed justifiable to consider faults between the potheads and the oil switch in the same category as bus faults and to clear them by the impedance relays in case they do not involve ground.

The ground-directional relay used performs a double function in that it provides selective back-up ground-fault protection in addition to controlling the telegraph circuit. It consists of a special directional overcurrent ground relay operated by residual current and zero phase-sequence potential and is arranged to trip the line in the usual manner through a set of auxiliary relays. This constitutes the ground-fault back-up protection which is co-ordinated with the ground-fault protection applied to the overhead lines previously described.

A small instantaneous overcurrent element is incor-

porated in the same case and the d.c. circuit is tapped after passing through the directional element and is brought out through the contacts of this instantaneous element and a second operation indicator to an extra stud on the case. From this point it is connected to the telegraph equipment. This provides the instantaneous directional control for the telegraph circuit.

The secondary and control connections of the directional overcurrent ground relay and telegraph equipment are shown schematically in Fig. 3.

Leased lines for pilot circuit

Four metallic telegraph circuits are employed, one for each 66-kv. cable line protected. In the design of the telegraph circuits and equipment consideration had to be given to obtaining a 10,000-volt insulation strength between the telegraph circuit and the Westmoreland substation ground and all control circuits in this station, since this is required by the Bell Telephone Company of Pennsylvania, from which the telegraph circuits are leased. This high degree of insulation is not required at either Richmond or Schuylkill generating stations, so the telegraph batteries are located at these points. The limitation of a maximum permissible voltage of 130 volts to ground for either conductor of the telegraph circuit makes it impossible to use the 250-volt ungrounded station control batteries. The batteries employed consist of 135-volt radio "B" batteries of the layer-built type, the circuits being grounded at their midpoints through grounds furnished by the telephone company. The resistance of the pilot-wire loops, including the tripping relays, is about 1,350 ohms, so that 100 milliamperes are circulated during the tripping operation. The minimum operating current of the tripping relays is 60 milliamperes.

A study of the fundamental circuit (Fig. 2) will indicate that if a short circuit occurs on the pilot-wire loop the circuit breaker at the end at which the battery is located will be tripped whenever the contacts of the directional relay at that end are closed, irrespective of the operation of the directional relay at the distant end. It would therefore be possible to obtain an incorrect operation of the protective scheme unless the directional-relay system is inoperative on load current. In addition, some means is provided for continuously supervising the pilot wire and for automatically locking out the system in case of trouble on the pilot wire.

Faulty operation avoided

Since ground relays only are used, the directional-relay system is inherently inoperative on load current. Continuous supervision of the pilot-wire loop is accomplished by normally energizing the circuit through sensitive fault detector relays. The general arrangement of the telegraph circuit is shown in Fig. 4. The contacts of the directional relays are not placed directly in the telegraph circuit, but close this circuit at each end through the agency of the auxiliary circuit closing relays. The circuit-closing relay at the battery station in its normal open position connects the pilot-wire loop to a separate 45-volt monitoring battery through a telephone type relay in each leg of the circuit. This monitoring battery is grounded at its midpoint so that the fault-detector relays detect grounds as well as short circuits on the pilot-wire loop. The operating current of the fault-detector relays is about 2 milliamperes, so that this fault-detector system is sufficiently sensitive to detect fault resistances five times higher than the maximum value which could cause the telegraph system to function incorrectly.

A manually reset lockout relay is provided at the battery station which is operated by the fault-detector relays through an intermediate oil dashpot time-delay relay. Time delay is necessary, because whenever a through fault occurs on the power system in such a position that the directional relay at the end away from the fault-detector system operates, this will operate the fault-detector relays. The time delay is introduced to prevent a lockout operation by giving the system fault time to be cleared and the directional relay to be reset. This time delay is not critical and is made about five seconds. Since the contacts of the fault detector and oil dashpot relays are designed for 48-volt operation, the energy for the lockout function is derived from the 45-volt battery. The use of separate batteries for the tripping and monitoring functions limits the drain on the tripping battery to the 100 milliamperes momentarily required when tripping takes place and thus insures its operative condition. A small voltmeter is provided for periodically checking the battery voltages.

The telegraph equipment at each station (exclusive of the batteries and battery voltmeter) is mounted in a standard relay case. The assembly used at Richmond and Schuylkill at the battery ends of the pilot-wire loops (Fig. 5a) comprises Ward Leonard tripping and circuit-closing relays, Western Electric B-17 relays used as fault detectors and Strowger oil dashpot time-delay and lockout relays. The lockout relay is arranged to be reset from the outside of the case.

The equipment installed at Westmoreland (Fig. 5b) consists of Ward Leonard circuit-closing and tripping relays and a small high-resistance voltmeter used for checking the continuity of the pilot-wire circuit. The voltmeter is connected to the circuit by a highly insulated key arrangement operated from the outside of the case. It will be noted that the contacts of the Ward Leonard relays are carried at the ends of an insulating bar of sufficient length to provide the requisite 10,000-volt insulation between the contacts and the coils. The entire assembly is mounted on a phenolite panel which fits into the case. All of the Westmoreland assemblies were subjected to a 10,000-volt one-minute insulation test between the telegraph circuits and the control circuits and case.

The telegraph circuits are brought into Westmoreland substation through a special multi-conductor cable having high dielectric strength. Disconnecting facilities in the form of 5,000-volt (nominal outdoor rating) porcelain primary disconnecting blocks are installed in the basement and the connections from these disconnects to the relay assemblies are made with ignition wire. This is run directly into the assembly so that there is no danger of operators coming into contact with the telegraph circuits. Operating instructions state that the disconnects must be opened before the covers are to be removed from the assemblies.

Continuity checks and performance

The telegraph circuits are checked for continuity at hourly intervals at the same time that the other instruments in the substation are being logged. In addition, an operating test is made on each circuit every two weeks. This test is initiated by the Westmoreland operator, who throws the telegraph test switch (Fig. 4). This operates the circuit-closing relay and closes the telegraph circuit

at his end. Since the closure of the circuit produces the same effect as a pilot-wire short circuit, the fault-detector relays at the battery end operate and after five seconds lock the circuit open and sound an alarm. This indicates that the fault-detector lockout system is functioning properly and also tells the Richmond or Schuylkill operator that the test has been started. This operator then resets the lockout relay and immediately throws the telegraph test switch at his end. The telegraph circuit is now completely closed on the tripping battery and the line should be instantly tripped at both ends. After the line trips the telegraph test switches at both ends are reset, completing the test.

This protective system was installed in November, 1931, on one of the 66-kv. cables as a trial installation and the satisfactory results obtained led to similar installations in September, 1932, on the three remaining 66-kv. cables. In the first twenty-six circuit months that this protection was in service fourteen faults occurred on the cables protected, during which time there were also nine cases of through faults sufficient to operate the directional-relay system at one end. The pilot-wire operations were all correct with one exception, in which case the line was not tripped by the pilot-wire equipment, although a test made immediately after the trouble indicated that the equipment then functioned correctly. Several days later an open circuit developed in the pilot wire, and it is thought that this defect was in some way responsible for the failure to operate at the time of the cable fault.

The battery performance of the initial installation is interesting. The open-circuit battery voltages were 50 volts per 45-volt unit on installation and only dropped to 47 volts after a year of service, during which about forty tripping and testing operations took place.

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Absorbers Devised for System Fifth Harmonics

Harmonic absorbers in both static and rotary design have been devised to maintain the sinusoidal wave form of lightly loaded interconnected high-voltage systems of large extent. These are described by J. Harcourt Williams in the February issue of the *Journal* of the Institution of Electrical Engineers. British experience has been that although the third harmonic arising out of the distorted wave of magnetizing current is usually absorbed in the delta or tertiary winding, the fifth harmonic (next in magnitude to the third) must pass into the system as the only path for its circulation. At times of light load, with few generators running and many large transformers connected, an increased fifth voltage harmonic is essential to supply the requisite harmonic of magnetizing current. The capacitance of an extended system tends to exaggerate the effect of these harmonics unless they are absorbed.

The static equipment consists of a transformer supplying static condensers with an automatic regulating resistance and control gear, the whole forming a three-phase resonant circuit. The adjustment is made by means of a voltmeter which is set to respond only to the 250-cycle (fifth harmonic of 50-cycle) component of the system voltage. The rotary harmonic absorber is connected to the low-voltage (6.6-kv.) side of the system and operates as a synchronous motor fed by the 250-cycle current component. The stator can be shifted so as to insure that the phase relation of harmonic and fundamental are correct.

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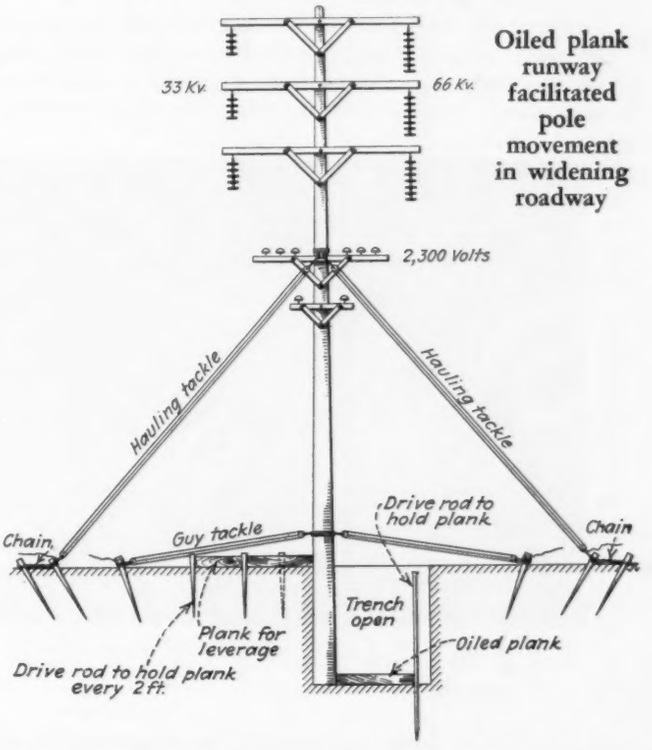
Moving Live High Line in Highway Widening

By GUY F. HARDEN

To maintain service while moving a wooden-pole transmission line in connection with highway widening an effective method was devised, as follows: The line carried 66-kv., 33-kv. and 2,300-volt circuits, heavy chestnut poles being used. The problem was to move the line 10 ft. back from the road on a 10-mile stretch. At each



Oiled plank runway facilitated pole movement in widening roadway

pole a trench 10 ft. long was dug to the base. The pole was then jacked up a few inches and a plank 9 ft. long, smooth and oiled on the upper side, was placed in the trench and slipped under the pole. Under the 2,300-volt crossarm a rope collar was then placed and block and falls attached in two directions. Another rope collar was placed close to the ground level, running guy ropes in two directions to provide leverage and prevent slippage of the pole. A long plank was placed on the ground with one end against the pole to hold any slip. The crew then hove down on one tackle and slackened the other.

When the base of the pole reached the end of the 9-ft. plank the drive bar holding the latter in place was pulled out and the pole was then dropped about 2 in. down to earth. The tackles and guy wires were carried well out away from the pole so that if a wire broke or pulled off an insulator no one was underneath while the pole was moving. Each man was assigned a definite task and the whole line was removed rapidly and without trouble.

National Industry Advance Led by Metals

Industrial activity during February, measured by electrical energy consumption, increased 5 per cent compared with January, 8.3 per cent over December and 17 per cent over the minimum of last August, but was 13 per cent under that of February, 1932. This makes the month's all-industry average the lowest for any February since 1923, which is as far back as these records go. The latter is the dark side of the picture.

For comparison, we have the fact that during the past three years operations have been less active in every month than in the corresponding period of the preceding year, resulting, during the past six months, in one record low point after another. The continuation of this condition is therefore no novelty.

Further, the industrial index has without exception shown a rise in February followed by a drop in March, probably caused by a slight delay in reading the meters at the end of the short month and so favoring February at the expense of March in the record of kilowatt-hours consumed. The present rise, then, again is no novelty.

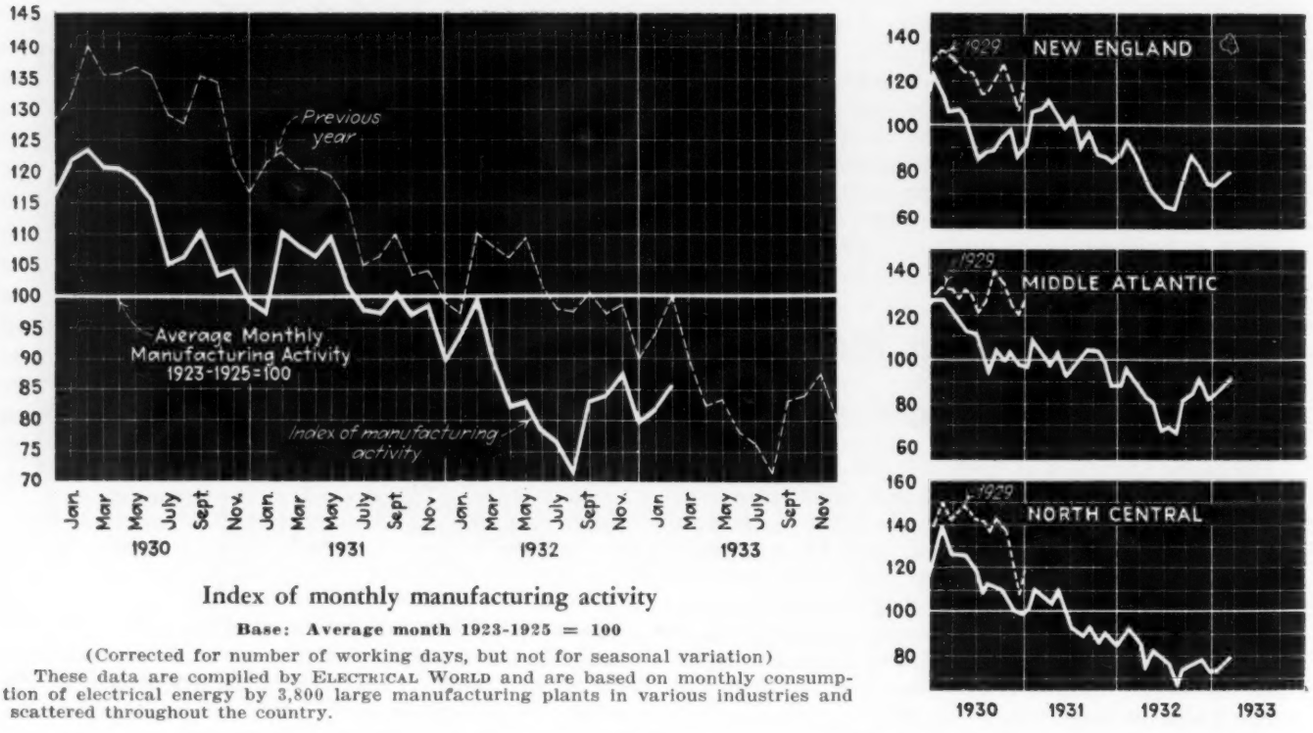
The significant change from former conditions is to be found by contrasting February with the average of the three summer months of the year before.

In 1930 February was lower by 5 per cent; in 1931, higher by 1 per cent; in 1932 the two were equal. Now, in 1933, February is higher by 13 per cent. Thus, for the first time in recent years this comparison shows a definite rise in productive activity.

In the country as a whole the advance over January was distributed quite uniformly among the various industry groups, except that textiles have flattened out, while the metals and leather industries gained more than their proportionate shares.

In New England there was a recovery in iron and steel and a further advance in metal-working, while textiles held close to the previous level. The leather industry alone was more active than it was a year ago.

Textiles in the Middle Atlantic and North Central states climbed from January and in both regions operations exceeded last year's February. Leather did the same. The rise in North Central metals, automobile and rubber manufactures continued.


Previous year
Average Monthly Manufacturing Activity 1923-1925=100
Index of manufacturing activity
Jan. Mar May July Sept Nov. Jan. Mar May July Sept Nov. Jan. Mar May July Sept Nov. Jan Mar May July Sept Nov
1930 1931 1932 1933
1929 NEW ENGLAND
1929 MIDDLE ATLANTIC
1929 NORTH CENTRAL

Index of monthly manufacturing activity

Base: Average month 1923-1925 = 100

(Corrected for number of working days, but not for seasonal variation)

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries and scattered throughout the country.

	United States				New England				Middle Atlantic				North Central			
	Feb., 1933	Jan., 1933	Dec., 1932	Feb., 1932	Feb., 1933	Jan., 1933	Dec., 1932	Feb. 1932	Feb., 1933	Jan., 1933	Dec., 1932	Feb., 1932	Feb., 1933	Jan., 1933	Dec., 1932	Feb., 1932
Industrial Groups																
All Industry	**86.0**	**81.9**	**79.4**	**98.9**	**79.8**	**75.5***	**75.2**	**94.1**	**92.3**	**85.7***	**83.3**	**94.5**	**80.5**	**76.3***	**72.1**	**95.8**
Automobiles (including parts and accessories)	61.2	59.2	56.2	85.3	.....	.....	.....	.....	71.4	65.5	67.0	91.0	60.2	58.7	55.6	86.1
Chemical products (including oil refining)	133.2	126.0	124.3	137.1	138.8	147.0*	134.0	150.0	143.2	133.6*	128.0	149.1	119.0	116.0	112.7	131.0
Food products	112.5	107.5*	103.2	129.5	.....	.....	.....	.....	114.7	106.0*	104.4	101.5	108.3	104.7	97.3	115.0
Iron and steel	64.2	58.4*	54.0	78.2	83.8	68.8*	80.8	100.3	48.8	47.0*	45.6	62.7	73.7	65.5	58.5	82.0
Metal working	58.4	52.8*	52.7	74.8	76.8	70.0*	71.4	95.7	54.1	50.3*	52.2	79.0	56.5	51.2	49.0	69.5
Metals group	60.6	54.7	53.3	76.0	78.8	69.7*	74.3	97.1	51.8	48.9*	49.3	72.0	60.1	56.5	53.0	74.4
Leather products	93.8	83.6*	79.8	90.6	85.3	76.4*	62.0	77.4	105.2	95.8	101.0	97.4	88.2	77.1	79.0	85.3
Forest products	93.3	90.4	83.5	86.8	46.6	38.9*	36.3	51.5	58.7	54.2*	54.0	54.0	75.8	67.7*	67.3	111.1
Paper and pulp	112.0	104.4*	98.8	116.5	103.5	99.2	101.0	128.0	89.9	83.2*	60.0	73.4	108.3	98.1*	93.3	105.7*
Rubber products	91.0	85.2	77.2	112.0	91.2	89.7*	97.8	109.4	.....	.....	.....	.....	88.1	81.5	70.5	121.0
Shipbuilding	89.2	83.5	84.0	99.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stone, clay and glass	60.3	58.5*	56.2	90.0	.....	.....	.....	.....	36.7	43.3*	36.2	84.8	84.0	73.7*	66.5	100.3
Textiles	84.1	85.0	86.5	96.8	64.3	63.7	63.5	76.8	123.0	111.8	117.8	113.1	117.1	109.2*	109.0	112.7

* Revision.

St. Lawrence Tied to Promotion of Domestic Load

Power Authority believes that 3-mill power can be delivered in New York City for 5 mills to sell for 3 cents and pave the way everywhere for the long-predicted 3,000-kw.-hr. home.

AGREEMENT on joint recommendations by U. S. Army engineers and representatives of the New York State Power Authority as to the maximum cost to New York of St. Lawrence River development has overcome one of the last remaining obstacles to early initiation of the project, according to the second annual report of the Power Authority, just submitted to Gov. Herbert H. Lehman and the Legislature.

Congress must give final approval to these joint recommendations, which, among other provisions, fix $89,726,000 as New York's share of the capital cost. With this done and the St. Lawrence treaty with Canada ratified by both countries the Power Authority will be enabled to undertake the final steps toward fulfillment of the state's purpose to develop, at assured low cost, the immense water-power resources on the St. Lawrence for the benefit chiefly of the household and rural consumers of electricity in the state. If the treaty is promptly ratified, so that the project can be constructed on the basis of present low prices, "the cost should be so greatly reduced as to provide probably the cheapest electricity available in large units anywhere in the United States."

The principal steps toward actual initiation of the project are outlined in the report as follows:

1. The Power Authority convinced the federal administration that New York has made satisfactory provision for utilizing the power of the St. Lawrence and that it is in the interest of the nation that the power be subject to the control of the public agency established for the purpose.

2. The Power Authority secured the assurance that nothing in the St. Lawrence treaty would be detrimental to the state's purpose in developing the power. An understanding was reached that New York should have the right to develop the power on the United States side of the international border.

3. After more than ten years of negotiation the treaty was signed on July 18, 1932. A special subcommittee and the full Senate committee on foreign relations approved the treaty and the settlement of domestic questions affecting New York's interests.

4. The Power Authority secured approval of an amendment to the treaty without which New York might have been deprived of a quarter of the flow of the river at the main power site. The power involved would have a potential value of nearly $100,000,000 over the 40-year period of amortization of the project.

5. The preliminary understanding was secured that New York's share of the capital cost should be $89,726,000. This is approximately $60,000,000 less than the cost to New York first suggested by representatives of the federal administration.

6. Through the investigations of its engineers the Power Authority has developed a scientific method of determining the cost of distributing electricity to domestic and rural consumers and thereby has laid a foundation for negotiating fair contracts with the private utility companies for the sale of the power, according to the direction of the law.

The report advises that the Power Authority must complete arrangements for the sale of the power and the financing of the project before it can proceed to a successful conclusion. The treaty must also be ratified by the United States and Canada and enabling legislation, embodying the joint recommendations of the Army engineers and the Power Authority as to cost, as well as providing representation for the Power Authority on all boards and commissions charged with the handling of the construction and operation, must be enacted by Congress. This legislation, the report recommends, should also specifically provide that the state in due course should have full and perpetual title to the American share of the flow of the river and to the power houses and the lands upon which they are situated.

Legislation for municipal retailing urged

In a specific request to the Legislature the report says:

"In order that the Power Authority may be placed in the most advantageous position for the negotiation of contracts for the distribution of the power through the private utility companies . . . the trustees respectfully renew their recommendations for the early enactment of legislation giving municipalities power to purchase and distribute electricity when duly authorized by a majority of the qualified voters."

Assuming $89,726,000 to be New York's capital cost, the report discusses three possible methods of financing and their effect upon power costs. It says:

"If financed by the Power Authority with 5 per cent bonds and provision for amortization over a period of 40 years the annual costs, including renewal, maintenance and operation, would be approximately $6,800,000. This amount includes nearly $900,000 a year for amortization, thereby also eliminating at that time more than $4,000,000 in annual interest charges. Thereafter the annual expense will include only the cost of renewals, maintenance and operating, totaling not more than $1,500,000, reducing the per-horsepower-year cost of generating the power to an almost nominal figure.

"On the assumption that there will be 710,000 firm horsepower available, the annual cost during the first 40 years will mean power at considerably less than $10 per horsepower-year, without making any allowance for the undoubted value of a large amount of secondary power available during a portion of the year. If this firm power could be used at 100 per cent load factor the annual cost would be equivalent to less than 1.5 mills per kilowatt-hour.

"In the event that the capital cost is financed on the basis suggested by the State Department early in the negotiations, in accordance with which the Power Authority would pay its share to the federal government in annual installments over a period of 40 years, with interest at 4 per cent, the annual costs would total around $6,000,000. This would mean firm power at about $8.50 per horsepower-year, or around 1.3 mills per kilowatt-hour if used at 100 per cent load factor.

"The general consensus in the discussions with the federal government has been that New York would finance and construct its power house superstructures and install its machinery, while the federal government would finance and construct the remaining works, with provision that New York pay its share of the cost of such works on the annual payment basis. On this assumption the power will be available at an annual cost of about $9 per horsepower-year, or about 1.4 mills per kilowatt-hour at 100 per cent load factor."

Present costs lower than original estimates

These cost estimates, it is pointed out, are based on 1926 unit prices. "No allowance is made in these calculations," the report says, "for the probability that the works will be constructed for materially less." New York, according to the understanding with the Army engineers, would share proportionately in any savings, which are estimated to be, if construction starts soon, at least 20 per cent. In any event and allowing for all contingencies, the $89,726,000 figure is a maximum.

In order to be conservative, however, the Power Authority report uses the 1926 prices, without allowing for savings, and finds that it "can count on producing power ready for transmission, on a 100 per cent load factor basis, at from 1.3 mills to 1.5 mills per kilowatt-hour."

On a 50 per cent load factor basis, "representing a conservative assumption as to the possibilities of marketing," the generating costs would range between 2.6 mills and 3.0 mills per kilowatt-hour.

The difference between these costs of generating St. Lawrence power and the costs of power generated by private companies in the state is discussed as follows:

"For purposes of comparison the Power Authority had a study prepared showing actual generating costs for the utility companies in New York State, including a 7 per cent return on the capital invested in the generating stations. This study developed the fact that the average cost of water-power generation for the entire state was 4.414 mills with an average load factor of 51 per cent. The average cost of steam power generation for the entire state was 10.654 mills with an average load factor of 31 per cent.

"Such comparisons show that 710,000 firm horsepower, generated on the St. Lawrence at from 2.6 to 3.0 mills per kilowatt-hour on a 50 per cent load factor basis, will greatly facilitate the transition to lower promotional rate schedules in the state."

Delivered in New York at 5 mills

Tentative studies of transmission costs, the report submits, show that St. Lawrence power can economically reach the New York metropolitan area. Assuming a specified type of transmission system, generating costs as just given, and further assuming that a quarter of St. Lawrence power would be used in the region near the plant and the balance transmitted to a substation in the Mohawk Valley, half of this quantity to be distributed there and the rest sent to southern New York, the preliminary conclusions as to cost, according to the report, are:

"On a 50 per cent load factor basis power could be delivered at the terminal substation near New York City at not more than 5 mills per kilowatt-hour, this cost including generation, transmission and allowance for losses in transmission. If built at present prices the cost would be less.

"While a 50 per cent load factor has been assumed in the above calculations," the report says, "actually the most economical use of such a block of power would be as base load in conjunction with existing steam plants. This combination would make it possible to use St. Lawrence power in the New York City area at a load factor much higher than 50 per cent and possibly at some periods approaching 100 per cent. As the total costs of transmitted St. Lawrence power are practically constant, irrespective of load factor, the average cost per kilowatt-hour delivered would be proportionately reduced, with the lower limit approaching 2.5 mills."

New York Assumes One-Sixth of Cost

	United States	Canada
Total expenditures	$272,453,000	$270,976,000
Deductions representing amounts already expended or appropriated for Welland Canal and Upper Lake channels	14,461,000	128,000,000
New funds required	$257,992,000	$142,976,000
Share to be contributed by New York and Ontario power projects on basis of present understanding	89,726,000	104,133,000
Balance of new expenditure required to complete seaway	$168,266,000	$38,842,000

Details of New York Power Project

Maximum investment under U. S. engineers-Power Authority joint recommendations	$89,726,000
Installed horsepower	1,100,000
Firm horsepower	710,000
Investment per installed horsepower	$81.60
Investment per firm horsepower	$122.40

Grand opportunity for promotional load building

Discussing for the first time some of the possible markets for St. Lawrence power, the Power Authority calls attention to the mandate of the Legislature that the power development "shall be considered primarily as for the benefit of the people of the state as a whole and particularly the domestic and rural consumers. . . ." Use for industrial purposes shall be secondary, according to the law, and chiefly to achieve lowest possible rates and increased consumption of electricity for domestic and rural customers.

Two broad markets are revealed, the report declares, "which may be counted upon to absorb all of the St. Lawrence power and in so doing to confer great benefits upon the state. The first of these will be found in the hitherto inadequately developed field of rural and domestic consumption. The second will be found in the industrial development which will take advantage of the availability of exceptionally cheap power in the region adjacent to the project."

In an analysis of these fields the report says:

"The law, in prescribing the lowest feasible rates for domestic and rural use, virtually directs the Power Authority to dispose of a great supply of power in such

a way as to secure for the homes and farms of the state effectively promotional rate schedules. Today the average home consumption in the state is not more than 600 kw.-hr. a year. This means that domestic consumers in the state are using electricity for little more than lighting and the smaller appliances. It means that rate schedules generally in New York State are not actually promotional."

In an effort to find some indication of the levels at which rate schedules become genuinely promotional the Power Authority sent questionnaires to private utility companies in the state, from which the following conclusions are drawn:

1. An average rate of 5 cents or more per kilowatt-hour is a barrier to the increase of the average home use of electricity above the present-day standard.

2. With an average rate of 3 cents or less per kilowatt-hour a higher standard of electrification for domestic service and a consequently greater consumption of electricity will be encouraged.

Northwest and Ontario experience cited

In support of these conclusions, derived from data showing average rates and consumption furnished the Power Authority by New York companies, the report also cites figures from the Seattle municipal plant showing for 1931 an average domestic consumption of 1,098 kw.-hr. per year at an average rate of 2.8 cents per kilowatt-hour; the equivalent figures for the Tacoma plant being 1,550 kw.-hr. per year at an average rate of 1.73 cents.

"These figures suggest that truly promotional rate schedules might encourage homes and farms throughout the state to double their use of electricity."

Enumerating some of the uses to which such increased consumption might be put, the report continues:

"The replies to questionnaires showed that in 1930 there were 3,187,978 consumers of electricity in the state who used 1,912,562,838 kw.-hr., giving the average of 600 kw.-hr. per customer per year. An increase in the average home use to 1,200 kw.-hr. per year assumed above would mean a market for an additional 1,900,000,000 kw.-hr., equivalent to approximately one-third of the potential output of the St. Lawrence project.

"The classes of consumption that may be affected most directly by the lower rates which St. Lawrence power should make possible include not only domestic but also commercial, street lighting and other municipal services. In 1930 these classes of consumers in New York State used about 3,300,000,000 kw.-hr. of electricity.

"As there is very considerable room for expansion in each class, once rates are such as to encourage it, there is every reason to feel assured that St. Lawrence power, disposed of in accordance with the purpose of the law, will create its own market.

"The expectation that low rates will automatically create a market for St. Lawrence power in the homes of the state is supported by the statistics of average domestic consumption in cities served by the publicly owned Ontario Hydro-Electric System. In 1931 residential use of current in 25 of these cities, which have a population of 10,000 or more, averaged approximately 1,500 kw.-hr. per year.

"The extent to which the electrical industry itself is expecting extraordinary increases in the domestic use of electricity is reflected in the annual issue of the ELECTRICAL WORLD published to coincide with the National Electric Light Association convention. The May 28, 1932, issue of this publication contains an article on the possibilities of the electrical market which assumes an available business in the field of domestic consumption averaging 3,000 kw.-hr. per year per home.

"If the average use of electricity in the homes of New York State should approach this figure the domestic market alone would absorb as much as 7,000,000,000 additional kilowatt-hours, or more than the entire potential output of New York's proposed power houses on the St. Lawrence.

"That this is not an unwarranted expectation is shown by the fact that the homes in Winnipeg have an average use in excess of 4,000 kw.-hr. a year."

On the basis of these studies of rates and consumption, together with the estimated costs of furnishing St. Lawrence power in accordance with the agreement on $89,726,000 as the capital cost of New York's power project, the trustees of the Power Authority state their conclusions as to the economic importance of the development and its effect on rates as follows:

"The trustees feel that the availability of a huge block of exceptionally cheap hydro-electric power will furnish the increased current required at such a low cost as to assist the electrical industry to shift to the low promotional rates which will ultimately make possible the complete development of the domestic field.

"This accommodation, requiring a minimum of capital outlay on the part of the industry, will serve to bridge over the transition period which forward-looking utility executives see as the chief obstacle to the sharp rate reductions necessary actually to bring about that extensive domestic utilization of electrical equipment upon which the future well-being of the industry seems to depend."

As for negotiations with private utility companies for the sale of the power, the report says the "progress that has been made during the past year toward the actual initiation" of the project and toward establishment of a basis of co-operation with the federal government "suggests that the present year will see a resumption of negotiations with the representatives of the public utility companies."

The report is submitted to Governor Lehman and the Legislature under the signatures of Frank P. Walsh, chairman; Delos M. Cosgrove, vice-chairman; James C. Bonbright, secretary, and Morris Llewellyn Cooke and Fred J. Freestone, trustees.

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Savings in Industrial Installations*

"One plant used 50 per cent of its total power for compressing air. Examination showed leaks in pipes, bad joints and general poor use of air. These conditions were corrected, two air-driven tools were changed to motor drive, some air lines were disconnected. The 50-hp. motor then could be replaced by a 15-hp. motor.

"Another plant was running a 60-hp. air compressor to operate a small hoist. The hoist was equipped with a ¾-hp. motor, which permitted the shutdown of the 60-hp. unit."

**From the power sales files of the Cleveland Electric Illuminating Company, cited by W. E. Benninghoff to Electrical Maintenance Engineers' Association at Electrical League of Cleveland.*

Industrial Installation Planned for Maximum Economy*

By J. G. CARRIERE and C. F. HENDERSON
Electrical Engineer, Shell Chemical Company — *Electric Machinery Mfg. Co., San Francisco*

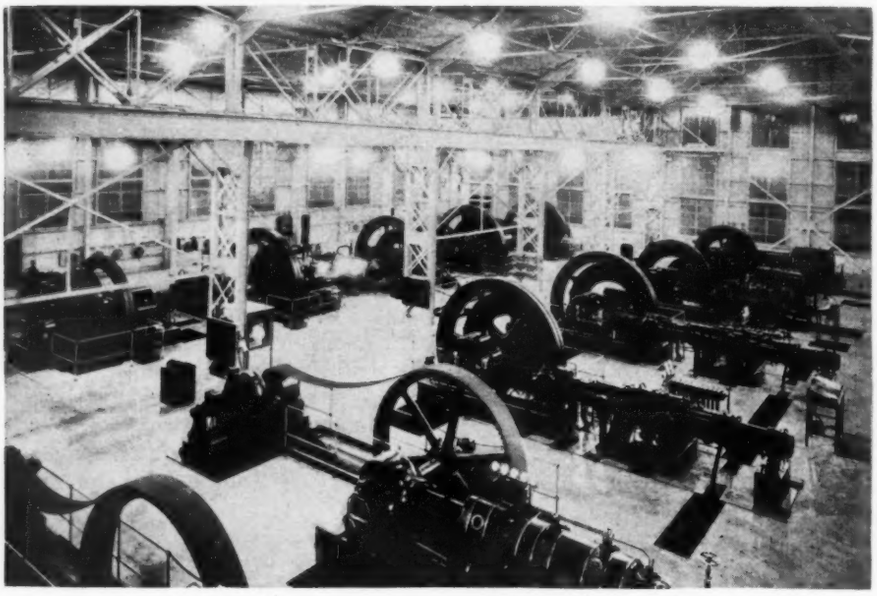
New plant of the Shell Chemical Company, first of its kind in the United States to employ the recently developed low-pressure process of ammonia synthesis, has installed capacity of more than 13,000 hp., two-thirds of which consists of large synchronous-motor units. Power, being a major item in production cost, demands an installation developing high load factor and high power factor for maximum economy

FOR the production of fixed nitrogen compounds the Shell Chemical Company has recently completed at Shell Point, California, a plant employing a new process of ammonia synthesis. Cracking natural gas to produce hydrogen, extraction of nitrogen from air by the Linde method and synthesis of the two gases into ammonia are the principal steps in the process. The process is unusual in that ammonia is formed at the relatively low pressure of 100 atmospheres in quantities to make costs compare favorably with previous commercial methods. A conspicuous element in the attainment of low production costs in the new process is a large and well-planned use of electric power. The initial installation at Shell Point is composed of two units, each with a daily capacity of 30 tons of nitrogen. Two-thirds of this output is in ammonia sulphate (fertilizer). The remainder is sold as liquid ammonia for industrial purposes. By-products are benzol and carbon-black mostly.

Electrically, the features that make this plant outstanding are very great concentrations of power with extremely high load and power factors, extensive application of electricity to control, signaling and operating functions as well as to power drives (conspicuous in this field is a new system of low-voltage remote control and remote indicating) and the meticulous care in design and installation given to even the smallest details in the electrical application.

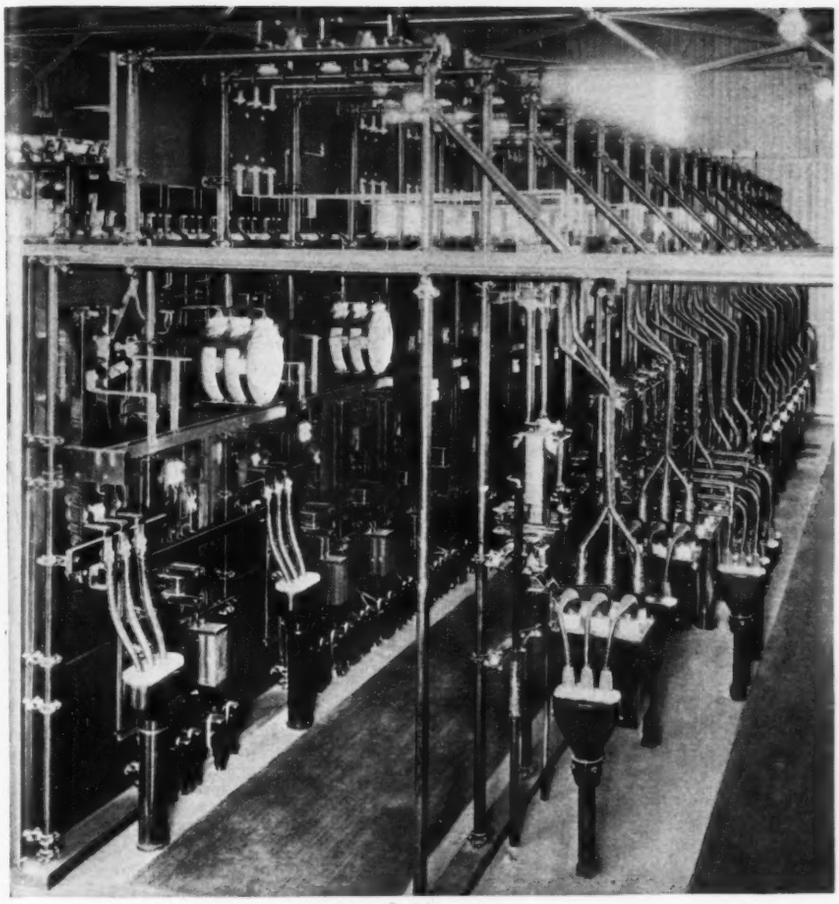
Through a Pacific Gas & Electric Company substation on the property two 60-kv. lines from separate sources and each capable of carrying the entire load if necessary are paralleled to supply energy to the plant. Plant distribution is at 2,300 volts from a 2,000-kva. transformer bank. All circuits for the compressor building are taken from one of two 2,300-volt switchboards, designated respectively "A" and "B." From the second board, "B," eight circuits run under ground to riser points in the overhead distribution system. A feature of the 2,300-volt substation construction is the use of "transite" tubes for wall bushings, the bare conductors passing through the tubes with no internal supports.

**Permission to reprint all or part of this article must be obtained from the Shell Chemical Company.*



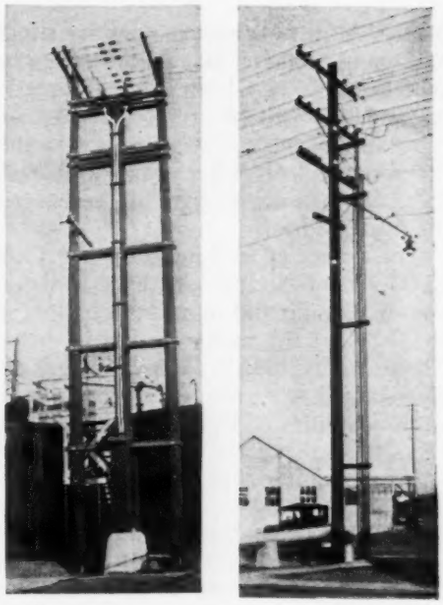
Compressor room contains 8,200 hp. in synchronous motors

The ammonia compressors are belt driven by 200-hp., 600-r.p.m. motors with part-winding starting to reduce inrush current. All the other compressors have direct drives. The nitrogen compressors are connected to 600-hp., 128-r.p.m. motors and require flywheel effects of 815,000 WR^2 to prevent pulsation and hunting. The raw-gas compressors are driven by 1,000-hp., 128-r.p.m. motors. On the left are air, condensation and mixed-gas compressors, driven by motors rated at 600 hp., 128 r.p.m.; 700 hp., 109 r.p.m. and 1,000 hp., 128 r.p.m. respectively. The condensation and mixed-gas compressors require fly-wheel effects of 1,173,000 and 1,500,000 WR^2 respectively. All motors are equipped with inclosed collector rings and oil-immersed push buttons, with control equipment located in another room because of explosion hazard.



Synchronous motor starting board

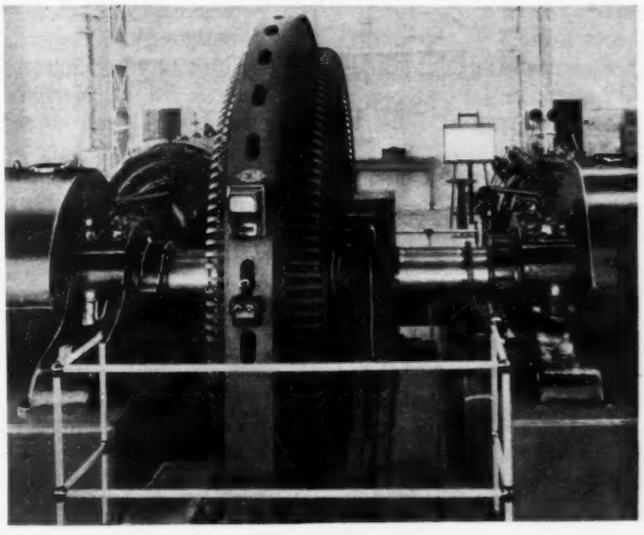
Removed from explosion hazard in the compressor room, synchronous motor-starting equipment is concentrated at this one location.



Compact, yet roomy, riser structure

(Left) Yard circuit riser with a capacity of eight 2.3-kv. circuits, four of which are now installed. The concrete duct is continued well above the ground level and the cables inclosed in a wooden housing to a 7-ft. height for protection. Space is left on the poles for future secondaries.

(Right) These poles are easy to climb because service conduits are installed alongside the pole on stub cross-arms, thereby removing all live circuits from the pole itself and providing unusual accessibility and flexibility in the power supply system.



Raw-gas compressor motor

Equipped with inclosed collector rings, ammeter and the oil-immersed push button.

For plant distribution poles are zoned into four levels, the top arm being for 2.3-kv. primary power, the next highest for 440-volt power and 220/110-volt lighting, the next crossarm for signal and remote control circuits and the lowest for the telephone and code-call cables. For buildings or concentrations of nominal amounts of power 2,300/440-volt, three-phase power transformer banks are mounted on pole platforms, while the larger banks are set on concrete pads on the ground, both incoming and outgoing circuits being brought in under ground. In all cases lighting circuits are taken from separate transformer banks.

All loads in the plant are served under ground in concrete-enveloped ducts, either by runs from the overhead system or from the main switchboard building. For isolated equipment, power, lighting, telephone, signal and control circuits are taken off the overhead system with lead-covered cables in vertical conduit risers which are supported on half crossarms mounted on the pole so that conduits, although parallel to the pole, are not actually fastened to it. An accompanying illustration shows this type of construction.

For the large manufacturing buildings, with heavy power demands, individual switchboards are provided either in the building itself or housed adjacent thereto. These switchboards supply motor circuits from individual switchboards or panels. In the service buildings, such as pump houses, machine shops, etc., the power supply terminates on a distribution board composed of switches and starters mounted on angle-iron frame, surmounted by an inclosed bus gutter. The bus itself is a rubber-covered conductor supported on strap-iron hangers. All exposed conduit in the plant is installed with conduit clamps, a feature which saves much time in the installation. Local distribution panels either feed distribution centers of a similar construction or serve the individual motor starters directly.

Motor control has been standardized throughout the

plant. All three-phase motors are supplied with individual remote-control magnetic starters and disconnecting switches. It has been general practice to mount the starters and switches remote from the motor itself, the push-button control being either at the motor or some other convenient point. For all machines electrical conduits are an integral part of the concrete foundation of the machine itself.

The connected load includes over 13,000 hp. of motors, 1,000 kw. of electric heat used in the synthesis and 300 kw. of lighting and miscellaneous loads. Approximately 4,000 hp. of the motor load is in units of under 50 hp. These motors drive pumps, valves, small compressors, blowers and other machines necessary in a plant handling large quantities of liquids, gases and other materials.

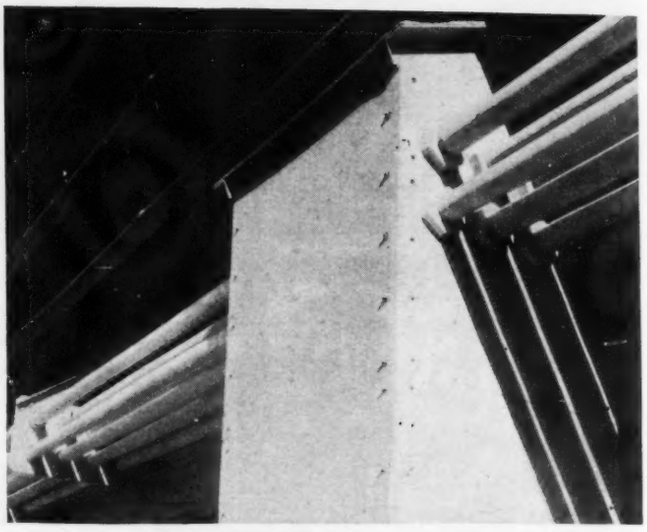
As the bulk of the power is concentrated in the compressor building a brief description of that installation is necessary fully to appreciate the features of the special control and indicating systems. Power is fed to the compressor building through two switchboards installed in a vapor-proof room on the lower floor. One switchboard and its associated transformer bank serve the 440-volt, three-phase power and the other the lighting circuits of the building. Aside from the 8,200 hp. concentrated in twelve synchronous motor units, there are a number of large induction motors served from magnetic starters on the power switchboard, the usual switches and remote starters being supplied for each motor.

In the compressor room the purification of hydrogen is accomplished by refrigeration and nitrogen is extracted from the air, both gases being compressed for the synthesis into the final product. The twelve synchronous motors, ranging in size from 200 to 1,000 hp., are required for the process. With two exceptions these motors are all direct connected and rated at 2,300 volts, three-phase, 60-cycle, 50 deg. C. rise, unity power factor and have inclosed collector rings and split rotors. Drive details are given in illustration captions. As there is a nominal explosion hazard in this building, vapor-proof fittings, oil-immersed push buttons and inclosed collector rings are supplied to eliminate possible arcing. Even the crane is supplied with power by a retractable system of "Tyrex" cables, rather than using the conventional trolley system.

All large motors are equipped with ammeters arranged and calibrated to read in per cent load. To protect the instrument, a double-pole, double-throw tumbler switch is installed to make it impossible to start the motor without short circuiting the ammeter. As the control for the synchronous motors is located in a separate building, all circuits to the twelve synchronous motors are ganged and racked in conduit for the run to a terminal board junction box which is divided into three sections, one for the 2.3-kw. power circuits, one for the 250-volt d.c. excitation circuits and one for the 250-volt a.c. remote-control circuits. Circuits to this junction box are carried under ground from switchboard "A" in the main switchboard building.

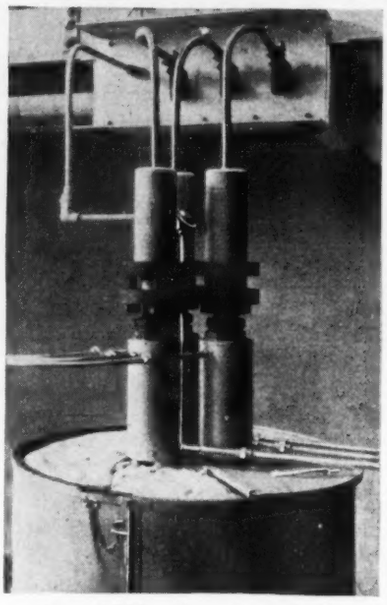
Elaborate alarm and control systems

As the magnitude of the process dictates that operations be carried on over a large area, a reliable system of alarms and remote control is important. The system selected for this plant utilizes lead-covered telephone cable operating on a 24-volt system. This cable is carried through the plant on the overhead system and has a capacity of 200 pairs of conductors available for control and signal circuits. With this installation it is possible to control any motor or group of motors in the entire plant area from any particular control center. In addition to saving space and reducing costs, this system has the further advantage of flexibility, it being possible to transfer control points by merely rearranging jumpers in the control junction box of the 24-volt system.



Bare bus in transite

Transite riser shaft and conduits are used to carry the bare bus to electric heaters used in the process. Note that transite conduit is threaded and fitted with locknuts of this material. So far as is known this is the first application of transite for this purpose.



Taps to electric heater from transite terminal box

As six gas holders are provided for storing the various gases used in the process, it is essential that operators know the storage available at any time. To this end a novel indicating system has been installed. On each gas holder a cable and counterweight are so installed that the cable follows the movement of the upper lift of the gas holder. One turn of this cable is wrapped around a wheel operating a drum switch, which then follows the cable movement. Instead of using the conventional cam contacts for indications, arms on the drum switch trip small mercury switches connected to the 24-volt signal and control circuit. Using mercury switches saves maintenance, eliminates corrosion and provides more positive action than the other method. These circuits terminate in the central junction box of the system, where indications from each tank are transmitted through relays over appropriate pairs of wires to any or all of the indicators

at the main control points. The indicators use a 24-volt automobile headlight reflector and lamp.

As there are five positions for each tank, indicators consist of five lamps mounted vertically behind appropriately lettered glass. Actually nine positions are shown as two-point lamps light when the holder is midway between two positions. In addition, an audible warning is set up when any tank comes within 3 ft. of the top or bottom of its travel.

Through the 24-volt system various low water, power failure and other alarms are operated. This system also is supplemented by a code call and P-A-X telephone exchange system carried in a separate telephone cable.

Transite ducts and boxes

An interesting innovation in connection with the electric heaters used in the synthesis is the use of transite conduit to eliminate fire hazard. Circuits to the two 150 and two 350-kw. heaters are carried from the transformer and control room as bare buses in a riser shaft of transite. Horizontal runs are made by placing the bare bus in a transite tube. These carry the circuits to junction boxes of the same material which are placed over the heater itself. So far as is known this is the first time that such an application has been made.

Another interesting detail consists of mounting small mercury switches directly on the blade of a triple-pole, double-throw transfer switch which transfers power from one heater to another. In the "up" position the mercury switch connects the pyrometer for the heater then in the circuit to the automatic control instrument. When the switch is thrown down connecting power to the second heater, the mercury switch, then upside down, connects the pyrometer in that heater to the automatic control circuit.

Plant lighting has been given close study for adequacy. Throughout the manufacturing building "Holophane" units have been used, RLM reflectors being used in the service building. All suspension fixtures are self-aligning and shock absorbing. In the compressor room ceiling units are mounted at a 32-ft. height on 24-ft. centers. These units are rated for 500 watts and lamped at present with 300-watt lights. Identical units are installed at lower levels around the side of the room, the upper units being equipped with "A-Symmetric" refractors for uniform illumination of horizontal surfaces and the lower units with "B-Symmetric" refractors which throw more light vertically than horizontally. The uniformity of illumination thus produced practically eliminates shadow.

Because power costs are a major item in this process, the electrical installation has been carefully planned for maximum economy. Although synchronous motors are of unity power factor rating, the average load per motor is calculated to be approximately 80 per cent, leaving the balance for correction of the lagging induction motor load. The combined load of the plant has the remarkably high power factor of over 99 per cent.

As the process is essentially continuous, it is possible to arrange loadings to result in a daily load factor of approximately 100 per cent. The combination of these two factors enabled the Shell Chemical Company to take advantage of minimum power rates for the process.

Although some of the mechanical equipment was imported, the entire electrical installation has been supplied by domestic manufacturers, the synchronous motors and switchboards being furnished by the Electric Machinery Manufacturing Company, Minneapolis, Minn., and other motor and control equipment by the Westinghouse Electric & Manufacturing Company, the General Electric Company, and the Weston Electrical Instrument Corporation. The electrical installation was designed and made by the Shell Chemical Company.

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Flexible Regulations for Motor-Starting Currents

By CARL W. EVANS

Commercial Engineer San Antonio Public Service Company

Maximum economy to customer and company is the keynote in a set of regulations governing motor-starting currents which were recently adopted by the San Antonio Public Service Company. Previously the starting current of any motor was limited to 200 amp. increments per half second and the installation of squirrel-cage induction motors larger than 50 hp. was not permitted, wound-rotor motors being required in the larger sizes. These regulations were based upon general good practice, but were objectionable because of the lack of flexibility. It required, in some instances, the purchase of expensive starting equipment or wound-rotor motors where almost unlimited current increments might be drawn without resulting in undesirable effects.

Under the new regulations motors of 15 hp. or less, meeting the N.E.L.A. starting-current requirements, may be connected without special starting equipment at any point of the general overhead distribution system. Similarly motors of 5 hp. or less may be connected at any point of the downtown underground system without special starting equipment. All motors larger than these two sizes installed in these two districts are considered as special instances and the proposed location is investigated. This investigation determines just what starting currents may be drawn at the proposed motor location without resulting in objectionable effects, and the customer is then advised as to just what type of starting equipment must be installed with the motor in question.

The division line of 15 hp. in the overhead distribution district threw the greater number of new motors into a group which required no investigation because it was known that they could be operated satisfactorily at any point of the system. Motors larger than 15 hp. are not so often moved and usually those owning and those in charge of their operation are representative of a larger business and are in a better position to understand that these starting-current requirements might be different at different points of the system. The division line of 5 hp. for the downtown underground network system was not quite as satisfactory as that of the overhead district, but it was necessary to limit general installations without motor-starting current limitation devices to motors of this size because of the existence of many radial network "fingers" in areas only recently converted to underground operation. The relative size of the underground system and the nature of the business served indicated that a special investigation of all proposed motor installations of more than 5 hp. would not be too great a burden.

Upon first consideration it might appear that these

regulations would require a great deal of engineering and investigation. After two years of application it has been found that no more time for such studies has been required than was necessary in enforcing the regulations formerly in effect. Fourteen major investigations were necessary in this period which required definite recommendations as to starting-current limitation equipment. All other proposed motor installations were of such a nature that no restrictions as to starting-current increments were required.

While the period in which these regulations have been in effect has been too short to lead to any definite conclusions, it is believed that they will result in improved voltage regulation, economical installations for customer, satisfactory customer relations and a minimum of engineering investigations of motor-starting currents.

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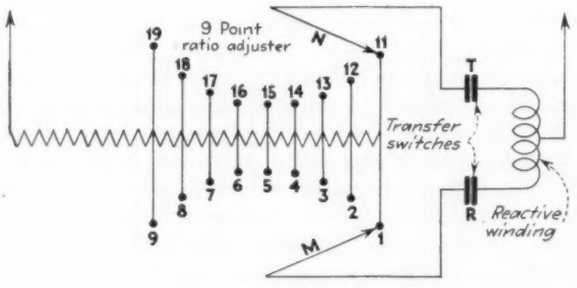
Internal Arcs Impossible With New Tap-Changing Sequence

By F. L. SNYDER

Transformer Engineering Department,
Westinghouse Electric & Manufacturing Company,
Sharon, Pa.

With the prevailing typical methods of changing taps (Fig. 1 is one) if the overload on the transformer at the instant a tap change takes place is such, due to a line short circuit or ground, that the transfer switch fails to open its circuit, arcing will occur on the selector switch in series with the transfer switch which is operating. Since the selector switch is mounted in the transformer tank, arcing will take place in this tank.

A new load tap changer, designated as the type "UT," has recently been developed which uses the method of changing taps shown schematically in Fig. 2. With this method only two selector switch operations, one at the beginning and one at the end of the tap-changing cycle, are required for each tap change. This sequence of operation eliminates any possibility of arcing in the selector switches, even though the transfer switch should fail to open its circuit. Since a line short circuit will usually be cleared in less than four seconds and the time in a normal tap change during which current is flowing through one-half of the preventive auto only will not ordinarily exceed one second, the probability of the sequence of events being such that the tap changer operates under short circuit, is remote and load tap changers have not in the past been designed to operate under this condition.



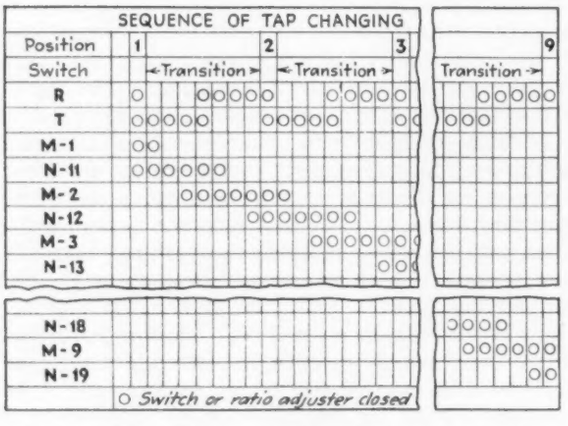
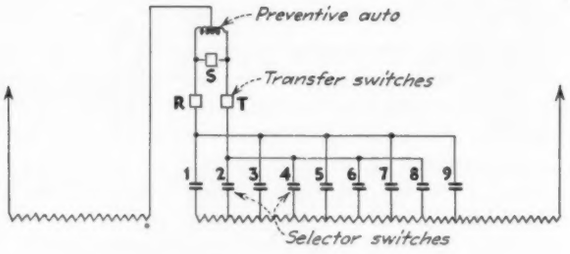


Fig. 1—Prevailing method risks internal arcing

If transfer switch should fail to open its circuit arcing will occur on selector switch if a short or ground occurs in the transition.



SEQUENCE OF OPERATION

Position	1	2	3	4	5	6	7	8	9
Switch No.1	○	○							
" No.2		○	○	○					
" No.3			○	○	○				
" No.4				○	○	○			
" No.5					○	○	○		
" No.6						○	○	○	
" No.7							○	○	○
" No.8								○	○
" No.9									○
" R	○	○		○	○	○		○	○
" T		○	○	○		○	○	○	
" S	○		○		○		○		○

○ Switch closed

Fig. 2—Only two selector switch operations per tap change

The first operation is the closing of a selector switch section in series with an open transfer switch. The last operation is the opening of a selector switch section after the transfer switch with which it is connected in series has been opened and the preventive auto short circuited and connected to another selector switch section.

The transfer switches of the type "UT" tap changer are designed to operate under short circuit even though the sequence of operation is such that arcing cannot occur on the selector switch.

In order to insure that the type "UT" tap changers would change taps successfully under line short circuit conditions they were operated from one position to the next adjacent one with approximately 25 times full load current flowing in the circuit at the rated voltage for the tap changer. So that the tests would be truly representative of field conditions, the normal voltage across the auto was made 2½ per cent of the line-to-neutral voltage. Inspection of the equipment after the short-circuit operation showed that no damage resulted.

Metals and Textiles Rise in South

In common with the rest of the country the South and West advanced in industrial activity. The former not only recovered the 4 per cent loss sustained in January but gained an additional 4 per cent, bringing the February index within 5 per cent of last year's for that month. The conspicuous increase in this section occurred in the metals group. In January the iron and steel industry leaped upward 42 per cent compared with December and held its new level in February.

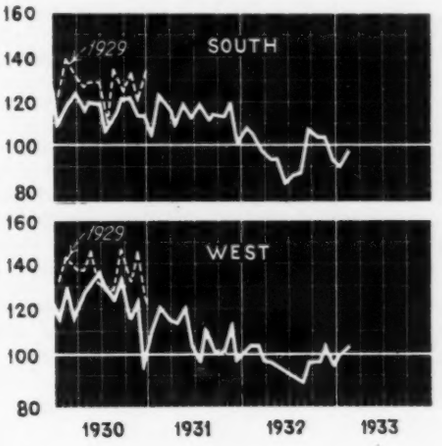
Now comes metal working, which had advanced but moderately in January, with a rise of 44 per cent. This advance brings current activity well above last year's for the month. It was quite general among the reporting companies, those showing a decrease being decidedly in the minority. In fact, with few exceptions the energy consumption was greater than in January notwithstanding the smaller number of working days in February.

In textiles the rise of 18 per cent from January compares with an advance of 10 per cent in 1932 and brings the industry 11 per cent above the activity at this time last year. In the chemical group oil refining decreased but this was balanced by gains in other branches.

Western operations rose to equality with those of 1932. This was the best showing of any section of the country. Last year's figures were attained or exceeded by the metals group, forest products, shipbuilding and the stone group. Each of these reported an advance from January. It is to be noted that these are all either construction industries or directly affected by activity in construction.

	South					West				
Industrial Groups	Feb., 1933	Jan., 1933	Dec., 1932	Nov., 1932	Feb., 1932	Feb., 1933	Jan., 1933	Dec., 1932	Nov., 1932	Feb. 1932
All Industry	**98.5**	**90.1**	**94.1**	**104.4**	**104.1**	**103.5**	**100.0**	**93.8**	**101.3**	**103.7**
Chemicals	135.2	132.7	142.6	142.9	134.9	82.5	78.2	76.8	82.2	91.6
Food	131.5	128.0*	124.3	138.7	151.0	121.0	116.2	113.2	113.0	127.0
Iron and steel	82.7	81.7	57.6	71.7	117.6	.....	.....	.....	.....	.....
Metal working	85.7	59.3*	54.5	61.7	68.8	.....	.....	.....	.....	.....
Metals group	84.0	71.8*	56.3	67.2	96.0	49.5	44.6	37.5	43.1	49.7
Forest products	37.6	36.6	38.7	51.4	60.8	148.0	145.7	130.3	145.7	135.2
Paper and pulp	158.0	137.7	138.4	157.5	140.5	129.1	138.4	125.5	141.7	139.3*
Rubber products	109.3	57.3	30.6	78.8	93.0	46.8	76.2	50.2	62.5	98.1
Shipbuilding	.....	.....	.....	.....	.....	121.7	107.3	112.4	113.0	87.4
Stone, clay and glass	85.2	73.0	117.3	143.4	94.7	83.7	78.0	64.5	77.7	80.8
Textiles	119.3	101.5	108.8	117.0	107.0	.....	.....	.....	.....	.....

*Revision.



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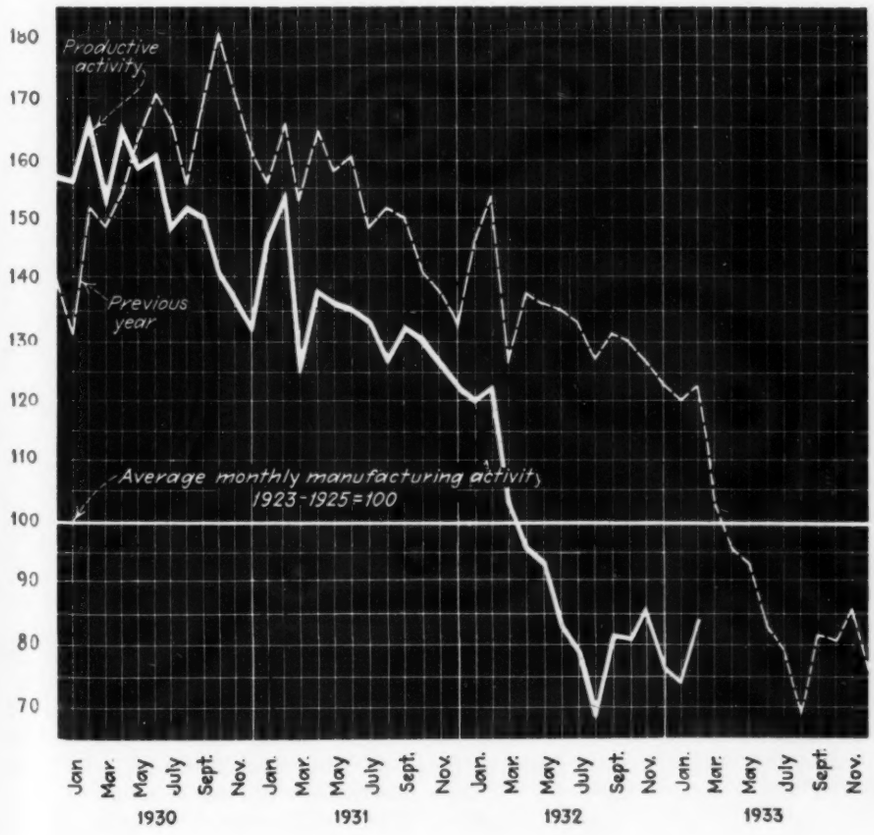
Electrical Goods Index Higher



Reports of electrical energy consumption in electrical manufacturing plants, received by ELECTRICAL WORLD in its monthly survey of industrial activity, indicate that while this industry is still operating at low rate there has been some recovery. The February index, adjusted for differences in the number of working days, shows a rise of 12.5 per cent from January. The gain exceeds that for corresponding months in 1930, 1931 and 1932.

In each of the major industrial areas of the country the reporting companies used more energy than in January, completely overcoming the effect of fewer days. Many of the smaller concerns in the Middle West showed strong gains.

Monthly Index of Electrical Manufacturing Activity

Adjusted to 26 working days
Base: Average Month, 1923-1925

Month	1930	1931	1932	1933
January	156.2	146.6	120.0	74.0
February	165.2	154.3	122.2	83.3
March	153.0	126.1	102.9	....
April	164.9	138.1	95.6	....
May	158.0	136.7	92.8	....
June	160.2	135.2	83.1	....
July	148.5	133.4	79.2	....
August	152.2	126.9	67.6	....
September	150.0	132.6	81.4	....
October	140.6	130.4	80.9	....
November	137.5	126.9	85.6	....
December	132.4	123.5	76.0	....

READERS' FORUM

Viewpoints Differ on Reducing Farm Line Costs

To the Editor of the ELECTRICAL WORLD:

I have read with interest the article entitled "Reducing Costs of Farm Lines" in the ELECTRICAL WORLD of February 18 and find that there are a number of statements expressed or ideas implied therein with which I believe issue may be fairly taken. I gather that it is suggested that:

(1) A moderately high primary voltage such as 13 kv. should be adopted for farm-line distribution; (2) costly transformer accessories such as arresters be eliminated, and that flashover gaps be installed instead; (3) self-protecting transformers may be used with advantage (presumably to save the cost of lightning arresters); (4) conductivity of the rural-line conductor is not for most farm lines of primary importance, and that therefore such conductors as copper-steel or bronze-steel may be used, giving lower over-all cost than copper (presumably through extra mechanical strength); (5) careful consideration be given to the class of pole used and that the type of pole used be not tied down to that carried normally in stock.

With regard to the type of pole used, I believe that in most cases there will be little choice available. In rural work the pole which is in the long run the most economical must of necessity be used. As an example, in eastern Canada we have a choice of three types of pole, the Western red cedar, the pine pole and the Eastern cedar. Owing to high freight charges and relatively short life the Western cedar is unable to enter into the picture at all except in the longer lengths where Eastern cedar is unavailable. While the life of the treated pine pole is still a matter on which there is a great deal of uncertainty, and while trouble is in some sections being experienced in obtaining a creosoting which is satisfactory in service, because of its strength-cost relation, it is, I believe, generally conceded to be superior to the Western cedar.

But considering the smaller size of pole, where Eastern cedar is available, and for use on rural lines where the extra strength of the pine pole becomes a superfluous factor, the Eastern cedar pole, due to its low cost and long life, becomes from an economical standpoint far and away superior to the pine pole, so that we find ourselves left with one permissible type of pole, the Eastern cedar, and with no alternative economically permissible.

With regard to the question of voltage, it is definitely impossible to recommend one voltage as the best for use on rural lines. The voltage range—that is to say, the group of two or three of the standard voltages which is most economical, is fixed by such conditions as the class of territory to be served, from the points of view of area, average load density present and anticipated, available sources of power and considerations pertaining to future operation. Given a voltage range, the choice of voltage is still further narrowed down by the choice of system of distribution, star or delta. Briefly, no one voltage can be recommended as the most suitable or the most economical for farm work unless the choice is at the same time tied down to a given set of local conditions.

Experience over a number of years has convinced me that some form of lightning protection for rural transformers is essential. In view of the low cost of present-day arresters in the ranges of voltages most in use today for rural work, I am unable to quite follow the suggestion that they be replaced by self-protecting transformers, which are at present very considerably more expensive than the ordinary distribution transformer equipped with two (or one) lightning arresters, as the case may be.

Without entering a general discussion of the soundness or otherwise of the use of the spill gap, on which there is at present a great diversity of opinion, there are two points which cannot be overlooked when considering its use on rural lines: On a grounded-star system the operation of the spill gap will in most cases cause an interruption to the service unless its form is such that definite interruption of the follow-up power arc is assured at the first half cycle. Such interruptions are growing less and less permissible in view of modern load-building efforts and the increasing quality of service essential thereto.

The cost of restoring the service is in many cases an item of major importance. With a delta system the operation of a straight spill gap without auxiliary arc-extinguishing features (with corresponding expense) is very liable to set up high-frequency oscillations, which in many cases will result in transformer breakdown. Since such trouble usually takes the form of insidious minute punctures which break down at some later date, often in the winter, the cost is considerable.

In other words, the suggestion that lightning arresters be replaced by spill gaps from an economy standpoint would seem, as far as the majority of rural distribution lines are concerned, to be open to serious question.

The particular advantage of copper-steel or bronze-steel conductors is their high mechanical strength. Since, however, even with heavy loading it is quite practical to go to 350-ft. spans with 35-ft. poles with such conductors as No. 2 A.C.S.R. worked up to only 60 per cent ultimate strength, and, in some cases, to accomplish the same result using only 30-ft. poles where less ground clearance is required, the advantage of using such extra high-strength conductors is not very apparent.

As spans are extended beyond 350 ft. the net initial saving on the cost of the line takes a sharp decrease. At the same time we commence to run into the problem of increased maintenance costs due to factors such as the "whipping" and "dancing" of conductors and breakages due to fatigue.

I cannot agree with the suggestion that the resistance of the conductor is of minor importance. Actually, the injudicious choice of a voltage, type of system and size of conductor are three of the factors most contributory to lack of success in the field of rural distribution. The most frequently appearing problem in the operation of the rural system is that of voltage regulation. It is at the same time usually one of the most costly to correct and a careful initial selection of conductor is essential.

Summarizing, I believe there is a tendency for writers on reducing rural-service costs to pay rather too much attention to the actual material parts of the distribution line. Actually the largest single items of cost of the rural line are those of labor and overhead, and it is there that the most effective savings can be made.

Standardization of material, careful planning ahead,

elimination of costly reconstruction at a future date, speed in actual construction and elimination of wasted time through proper scheduling (and holding to schedule of construction programs), avoidance of cumbersome overhead, all are vital factors in the reduction of cost of rural-line construction which are often not given their merited consideration.

If the pitfalls of selecting a higher than necessary voltage to take care of load that will never materialize, the choice of low-grade, low-initial cost construction are avoided and construction of the simplest type but highest grade are rigidly adhered to two of the more vital elements will have been satisfactorily taken care of.

It must always be remembered that the highest individual item in the annual cost of giving rural service, considering a truly rural system, is not the carrying charges on the plant investment, but is nearly always the cost of operation, and in the planning of rural extensions this factor must be considered.

M. J. KELLY,
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The Shawinigan Water & Power Company,
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BOOK REVIEWS

Hydraulic Machinery

By D. W. Mead. Published by the McGraw-Hill Book Com- 440 Fourth Avenue, New York, N. Y. 444 pages, illustrated. Price, $4.

Performance rules over design in the framing of this book on reciprocating and centrifugal pumps, siphons, rams, pulsometers and other hydraulic equipment than turbines. Eight chapters are devoted to basic treatment of energy, mechanics, thermal and fluid efficiencies, duties and ratings, plant losses and transmission of power in which the handling of steam and combustion equipment is greatly condensed. In the rest of the book most of the prevailing types of pumps are described and their design proportions analyzed mathematically. Test data are given for many of them along with occasional comparative costs for pumping. The contents are more useful than the privately printed product would lead one to suspect.

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Industrial Electric Heating

By N. R. Stansel. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. 444 pages, ilustrated. Price, $5.

A series of articles on industrial electric heating in the *General Electric Review* has been remolded and enlarged to constitute this book. The first four chapters lay a theoretical and factual foundation for electric heating by discussing heat production and transfer, chemical thermics, metallurgy, metallography and the heat-treating effects on metals and alloys. There follow five chapters on heating chambers and resistor furnaces, the effects of the various atmospheres provided in them and their application to brazing, annealing, enameling, etc. Melting and galvanizing follow. The remaining chapters deal with arc and induction furnaces.

There is occasional inclusion of operating performance data, but the book is far more valuable for the engineering and design data about heat and heat materials, the explanation of phenomena and the execution of principles into practical design. Power and apparatus sales forces will find the book as useful as will the industrial electric engineers to whom they are trying to sell the demonstrable and computable virtues of the electric way in heating.

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The Great Delusion

By E. Greenwood. Published by Harper & Brothers, 49 East 33d Street, New York. 238 pages. Price, $2.50.

That socialization of industry—piecemeal according to the latest strategy of our misleaders—is creeping up on us amain, with the utilities as the object of their lust, is the theme of the book. The socialistic movement is traced from the Greek prytaneum through to the current stages of the Russian enigma. Motivation is the same all along the line and the results not so different, whether the exponent be Plato, Owen, George, Debs, Lenin, Norris, Pinchot or Roosevelt. Muscle Shoals, Boulder, St. Lawrence are sketched anew to show the nature of the drive to oust utilities and ultimately all business from private control. Insurance, railroads, irrigation are there too as part of the picture of capitalism going, going, gone socialistic. The moral of the book seems to be that if capitalism doesn't go socialistic gracefully and voluntarily it will be made so by the less dignified route of persuasion.

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The Modern Corporation and Private Property

By A. A. Berle, Jr., and G. C. Means. Published by the Macmillan Company, 60 Fifth Avenue, New York, N. Y. 396 pages. Price, $3.75.

Four to seven millions of Americans who own stock in American corporations are mere vassals and pawns in a corporate feudal system in which the machinations of the overlords are far more obscure than the reign of the barons in Middle Ages. Technique in manipulation of control by small minorities has instituted a corporate revolution as profound in its social and political import as the industrial revolution upon which it has been founded. The safety of the citizen's accumulated wealth is reposed in councils from which he is virtually disfranchised. All manner of artifices bring this about—his holdings are diluted, profits are detoured, surpluses juggled, markets rigged, with the law sanctioning all but an infinitesimal fraction of the gyrations.

Less than a generation hence this book will be looked upon as the first exhaustive statistico-legal analysis of what has been happening while the dominant minority's share shrank as fast as the oligarchy of big business grew. For current study it will prove a revelation to those who have guilelessly and gullibly assumed that buying stock meant participation in the management of the business as well as in the profits.

The book is a sober and therefore not at all iconoclastic dissection of today's quasi-public corporations in their status as social institutions. Hundreds of examples are cited of the artifices by which the masters of railroad, utility and industrial corporations have exploited a fast-growing body of law which is already on the point of supplanting constitutional law as the fundamental code that determines our economic and social well-being as individuals and as a nation.

Men of the Industry

M. L. Sindeband Elected Officer of Ohio Utilities

M. L. Sindeband, formerly connected with the public utility industry as vice-president of the American Gas & Electric Company, has just been elected vice-president and a member of the board of the Ohio Electric Power Company and the Reserve Power & Light Company with offices in Marion. He also has been named permanent receiver of Columbus, Delaware &

Marion Electric Company to succeed W. P. Maloney. All these companies are members of the Ohio branch of the Middle West Utilities System.

As engineer, inventor and executive, Mr. Sindeband has contributed substantially to the development of the electric power industry. After connections with the New York Central Railroad and the Brooklyn Edison Company, he entered the engineering department of the American Gas & Electric Company in 1915 and within three years was named electrical engineer of the company. In this position he carried on extensive development work in transmission line and substation standardization and research work on oil circuit breakers and lightning protection. So successful was he in working out interconnection plans and the building up of a consolidated operating organization that he was subsequently appointed a vice-president, resigning from this office in 1927 to join the American Brown Boveri Company.

In addition to carrying on these executive duties, Mr. Sindeband has been a fertile inventor, having to his credit patents covering automatic train control, saturated core reactors and regulators, carrier-current communication and short-circuit current-control systems. He has written for the technical press and has presented several papers before the American Institute of Electrical Engineers. He has been an active committee worker in both the Institute and the National Electric Light Association.

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J. R. McDONOUGH, assistant to the president of the Radio Corporation of America, has been elected executive vice-president of that organization.

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CHARLES J. HATCH, superintendent of the new buildings department of the Edison Electric Illuminating Company of Boston, has retired from active business after completing almost 34 years of continuous service.

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OBITUARY

A. E. Fitkin

Abram E. Fitkin, public utility operator, died March 18, in his suite at the Hotel Savoy-Plaza, New York, in his fifty-fifth year. Mr. Fitkin's activity in the public utility field started in 1912 and within fifteen years, by gradually acquiring properties scattered in various parts of the country, he succeeded in obtaining control of substantial holdings. It was not until he started to dispose of some of the properties in 1926 that the details of his business activity became known. In that year he sold the National Public Service Corporation to the banking house of E. H. Rollins & Sons for a reputed price of $250,000,000, including the funded debt. In the same year he sold the Western United Corporation for $30,000,000. In the following year, as the result of another $30,000,000 transaction, he transferred control of the Inland Power & Light Corporation to the Insull interests.

After disposing of the Pacific Public Service Company in 1929, at a price not made known, he announced that he intended to devote himself primarily to stock market transactions rather than to public utilities, but his continued interest in this field was made known in 1932 through a transaction in which he acquired control of the American Gas & Power Company from the receivers of the American Commonwealths Power Corporation. Mr. Fitkin had formed a partnership with W. C. Harty in 1908 under the name of A. E. Fitkin & Company, which was succeeded in 1928 by A. E. Fitkin & Company, Inc., and the present firm of A. E. Fitkin & Sons, Inc., was organized in 1932.

John S. Jenks

John S. Jenks, who three years ago was named vice-president and chief engineer of the West Penn Electric Company, Pittsburgh, Pa., after a connection with that organization of almost thirty years, died March 16 at Mount Pocono, Pa., in his sixty-third year. He had been in failing health for several weeks. Joining the West Penn company in 1902, he filled positions of increasing importance in the company's service. As transmission engineer he engaged in work involving right-of-way and the engineering, construction and operation of transmission lines, substations and power stations. Subsequently he became assistant to the general manager, later assuming supervision of all activities relating to power service, and then undertook new executive duties as vice-president of the West Penn Power Company. It was in 1930 that he was elected vice-president and chief engineer of the West Penn Electric Company in charge of the electric properties.

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BRIG.-GEN. HARRY BURGESS, formerly Governor of the Panama Canal Zone, who was placed in charge of surveying and designing in preparation for the Muscle Shoals power development, died March 18, at the Army and Navy General Hospital in Hot Springs, Ark.

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BENJAMIN M. WHITTEMORE, 73 years old, formerly treasurer of the Century Electric Company of St. Louis, Mo., died at his home in Webster Groves, Mo., March 10, following a long illness. Mr. Whittemore retired as treasurer of the company in October because of his illness. He had been with the organization for about eighteen years. He was a native of Charleston, Ill., and was educated in the public schools there and at the University of Illinois.

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FREDERICK L. RHODES, electrical engineer and international authority on telephony, who for 40 years, until his retirement last year, was in the service of the American Telephone & Telegraph Company and its predecessor, the American Bell Telephone Company, died March 18, of angina pectoris, at his home in Short Hills, N. J., after an illness of about two years. He was 62 years of age. Specializing throughout his career as an engineer engaged in outside telephone plant development, he accomplished important work in connection with the standardization of materials, apparatus and practices in underground and overhead wire systems. Mr. Rhodes was a fellow of the American Institute of Electrical Engineers and an active member of the American Standards Association and of the American Association for the Advancement of Science.